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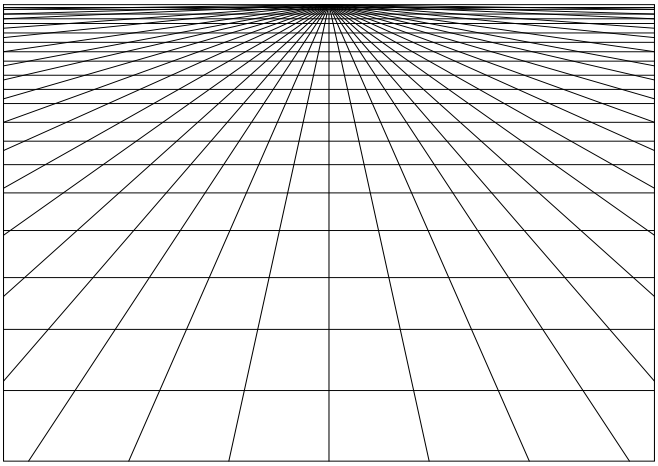

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Funding R&D Collaborations: Tangible and Intangible Innovation Outputs for Participating SMEs

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Abstract

In this study I explore ways in which innovation in SMEs is influenced by participation in the "Research for SMEs" funding scheme. Through an explorative multiple case study approach I analyze three R&D collaboration projects funded by the scheme. Semi-structured interviews and archive material is used for data collection. The study contributes to existing innovation literature by empirically investigating ways in which specific project characteristics influence performance during the project (PROPERF) and the innovation capability of the participating SMEs (INNOCAP). Among other things, the study suggests that the delegation of the coordinator role and EU's requirement to have international participants in the consortium have inverse effects on INNOCAP and PROPERF. This indicates that a trade-off situation between increasing firms' innovation capability and maximizing performance during the projects can occur. The project characteristics analyzed are related to both the characteristics of the funding scheme, and characteristics of the collaborative form chosen by the participants executing the project. Thus, the findings of the study can aid policy makers in designing funding schemes that stimulate achievement of intended innovation goals. In addition, the implications of the study can provide clues of the variety of effects of collaborating in certain ways.

Acknowledgements

Upon the completion of this thesis, there are a lot of people whose roles deserve to be recognized. First I would like to thank all the anonymous people I interviewed for giving their valuable time and sharing their experiences. I would also like to thank my contact person in the RTD for making the thesis possible in the first place, and for continuous assistance throughout the process.

Working on the thesis has been an emotional roller-coaster. A big thanks to my supervisor Sjur Kasa for the interesting discussions, and both intellectual and psychological support. I always left your office in a better mood than when I came in. Also, I will like to thank my girlfriend Luba for her love, support, and patience. Last, I would like to thank my family, friends, and fellow students at the TIK-center.

Thor Haugnæss

Oslo, October 2010

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Illustrations

Abbreviations

EU	European Union
FP	Framework Program for Research and Development
INNOCAP	Innovation Capability
IPR	Intellectual Property Rights
PDS	Product Development Speed – indicator of INNOPERF
PROPERF	Project Performance
RTD	Research and Technology Developer
SME	Small and Medium sized Enterprises
TI	pseudonym for the main Research and Technology Developer in the projects

1. Introduction

This thesis explores ways in which innovation in SMEs is influenced by participation in the "Research for SMEs" funding scheme. More precisely, an explorative multiple case study approach is used to identify specific *"project characteristics"* which emerge as influential. These project characteristics can either be related to the design of the "Research for SMEs" funding scheme (e.g., guidelines, requirements, procedures, etc), or the ways of collaboration chosen by the partners executing the project. Thus, the analysis can contribute to knowledge about how certain funding scheme designs, and certain ways of collaborating, can affect innovation in SMEs. Such knowledge, I argue, is important for the following reasons.

There is a major consensus that innovation forms the lifelines of organizations (Wind & Mahajan, 1997), and is a key factor for economic growth (Sollow, 1957). However, from the societal point of view, firms tend to under-invest in innovation and R&D due to their risky nature and difficulties of internalizing profits (Alm & Czarnitzki, 2003). To spur innovation, both EU and Norway have invested increasingly more in funding programs aimed at stimulating innovation in private enterprises (EU Commission, 2010b; NIFUSTEP, 2010). Ways of designing a funding scheme in the most efficient manner is therefore of primary concern to policy markers looking to stimulate innovation in firms. By investigating the variety of ways in which certain aspects of the funding scheme influence innovation in the SMEs, the thesis contributes to the acquisition of such knowledge.

As mentioned, the study also investigates how specific *ways of collaborating* affect innovation in the participating SMEs. Such knowledge is important since innovation projects increasingly take on collaborative forms (e.g., Swan & Scarbrough, 2005; Powell, Koput, Smith-Doerr, 1996; Narula, 2004). A partial reason for this is the general trend of increased knowledge content of products, and the coupling of previously distinct technological areas (Narula, 2004). The ability to collaborate with others is therefore an important skill to have in

order to innovate (Simonin, 1997). This is particularly the case for SMEs with limited internal competencies and material resources (Rothwell & Dodgson, 1994; Narula, 2004). Accordingly, the thesis can contribute with relevant knowledge about way(s) in which certain ways of collaboration affect innovation. Such knowledge can contribute to firms' decision making about ways of collaborating with others in order to accomplish desired innovation outcomes.

The focus on innovation in SMEs is particularly relevant in the Norwegian context. The Norwegian government has stated that SMEs are a particularly important target group for stimulating R&D and innovation (White Paper, 2008). The reason for this is that Norway is characterized by having proportionally more SMEs than most other countries (White Paper, 2006; Aftenposten, 2010). In fact, the number of SMEs, defined as companies with less than 100 employees, currently constitutes 99.5% of Norwegian businesses (Parliament Proposition, 2010). However, Spelling (2007) found that the twenty companies spending the most R&D in Norway actually constitute 40% of all private R&D spending. Consequently, the Norwegian government has a goal to increase innovation in SMEs (White Paper, 2008). By focusing on a funding scheme earmarked for SMEs, this thesis paper contributes knowledge about ways that funding schemes can stimulate innovation in SMEs.

This paper also adds valuable input to the academic literature by conceptualizing "Innovation in SMEs" as a dependent variable consisting of two dimensions: Innovation Capability (INNOCAP) and Project Performance (PROPERF). INNOCAP refers to the SMEs' ability to innovate at a later point. PROPERF refers to the performance of the consortium during the project in terms of product quality, product development speed, and chances for commercial success. I analyze ways in which specific characteristics of the projects influence both of these innovation outputs. The two dimensions have received much attention in previous research. However, few studies have synthesized the two strands of

research and empirically investigated how specific ways of collaborating affect the relationship between the two. I argue that since both INNOCAP and PROPERF are important innovation goals in collaborations, more knowledge is needed in this domain.

The thesis will start out by explaining the workings and rationale behind the "Research for SMEs" funding scheme and the basis for Norwegian participation. In the theoretical chapter I present the general theoretical framework used in the analysis, with the exception of more specific theories of factors influencing INNOCAP and PROPERF. The reason for this is the large number of such theories used in the thesis. For the sake of avoiding repetition and to provide a closer connection between theory and empirical data, these more specific theories will be woven into the analysis section. Next, I will describe and discuss the chosen methodology. In the analysis section I will first investigate project characteristics which emerged as influential on INNOCAP, and then on PROPERF. Based on findings indicating that some project characteristics have an influence on both dimensions, the next section will analyze ways in which certain project characteristics influence the relationship between the two. Lastly, political and theoretical implications of the findings will be discussed, followed by the evaluation of study limitations and proposed suggestions for future research.

1.1 The Purpose and Workings of the "Research for SMEs" Funding Scheme

The most notable feature of the "Research for SMEs" funding scheme is that the majority of the financial support is earmarked for the SMEs to subcontract R&D to Research and Technology Developers (RTDs). Examples of RTD performers include universities, research organizations and industrial companies. In this way a "customer-seller" relationship is established between the SME and RTDs. The central rationale behind the scheme is based on

the assumption that many SMEs have good innovative ideas, but lack the necessary abilities and material resources to perform the R&D "in-house" and to commercialize the innovation (EU Commission, 2010a).

"Research for SMEs" is a bottom-up scheme. This implies that the focus is on the interests and needs of the SMEs. As a consequence, the projects can address any R&D topic from the entire field of science and technology, and can entail developing new products, systems, processes, or services (EU Commission, 2010a). This is in contrast to other funding schemes in EU's framework program, which are focused on particular technological and scientific fields of interest to the EU. In order to receive funding from "Research for SMEs", the project must fit the overall business and innovation needs of the SMEs. The innovation idea must also render clear exploitation potential and economic benefits for the SMEs involved (EU Commission, 2010b).

From EU's perspective, another purpose of the scheme is to integrate and unite European research and foster cooperation between businesses across national boundaries. For this reason, the SME must establish a consortium consisting of minimum three SMEs and two RTD performers from different Member States or associated countries. All members of the consortium have a pre-defined function related to the R&D task or later commercialization phases of the process.

The upper limits for funding are as follows: 50% for R&D activities, 50% for demonstration activities, and 100% for project management, training and dissemination activities. This implies that the funding scheme does not only fund R&D, but also activities related to the following commercialization process of the innovation (e.g., dissemination and demonstration activities). The overall budget of the project is usually between €0.5 million to €1.5 million, and the duration is normally between 1-2 years (EU Commission, 2010).

1.2 "Research for SMEs": Institutional Context – EU's Framework Program

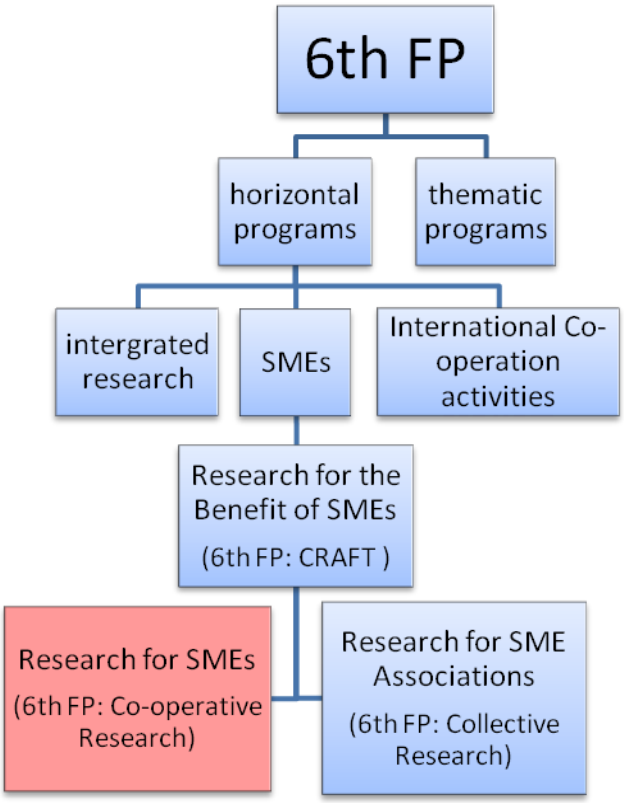
This section briefly describes the institutional context of the "Research for SMEs" funding scheme. The funding scheme is part of EU's "Framework Program for Research and Technological Development" (FP). The FP acts as an umbrella institution for all R&D related activities in the EU. Briefly summarized, each FP describes the present condition and challenges in the EU, the desired state in four years, and a step by step strategy of how to reach the desired state (EU Commission, 2006). It also allocates financial and human resources based on the set targets. Since the first FP was established in 1984, they have developed both in financial size, focus areas, and internal structure. In general, the main objectives of each program reflect the challenges and priorities at the time. We are now in middle of the 7th FP, which deviates from the former FPs by extending over six years (2007-2013). However, the projects analyzed in this thesis were part of the 6th FP (2003-2007). The reason for choosing projects from the 6th FP is that it allowed for analyzing the long-term effects in the SMEs.

The 6th FP was divided into seven "thematic programs" and three "horizontal programs". The thematic programs reflected the EU's R&D priorities, and the horizontal programs responded to the common needs across all research areas (EU Commission, 2010a; EU Commission, 2010b)[1]. "Research for SMEs" is part of the horizontal program of "SMEs". More precisely, it combines together with "Research for SMEs Associations" to make up the "Research for the Benefit of SMEs" program, a sub-scheme of "SMEs" horizontal program (see figure 1). "Research for SMEs Associations" is similar to "Research

[1] The seven thematic programs of the 6th FP were; *Genomics and biotechnology for health, Information Society technologies, Nanotechnologies and nanosciences, Aeronautics and space, Food safety and health risks, Sustainable development and global change, Citizens and governance in the European knowledge-based society.*
The three horizontal programs of the 6th FP were; *Integrating research*, *International Co-operation activities,* and *SMEs.*

for SMEs". However, whereas "Research for SMEs" focuses on the needs of the individual SMEs, "Research for SMEs Associations" funds these associations or industry groupings of SMEs with common problems or interests.

It is important to note that the names have changed from the 6th to the 7th program (see fig 1). In the 6th FP, "Research for the benefit of SMEs" was called "CRAFT", while the sub-scheme "Research for SMEs" was called "Co-operative research", and "Research for SMEs Associations" was previously named "Collective Research" (EU Commission, 2006). Despite some incremental changes in the level of funding between the two FPs, I will use the current names since the idea and structure of the programs are the same. This will also create less confusion for readers who are presumably more familiar with the new names.



Figur 1. The institutional context of the "Research for SMEs" funding scheme in the 6th Framework Program.

1.3 Clarification of Concepts

SME	In the "Research for SMEs" funding scheme SMEs are defined as companies with fewer employees than 250 persons, and have an annual turnover not exceeding € 50 million. In this thesis "SMEs" refer to the SMEs which had the idea for the product development, and was the official owners of the project. It does not imply other SMEs which in many cases was included as partners in the consortium. These SMEs will simply be referred to as "firms" or "partners".
Pseudonyms	Because the respondents were anonymous in the study they were delegated pseudonyms. The pseudonym of the individual projects is also used to describe the SME who was the owner for the project. In this way, it provides an easy read by not requiring readers to remember which SME/respondent who was participating in which project. The SMEs are given the following pseudonyms: Alpha, Beta, and Gamma. The RTD assisting in all projects are given the pseudonym of PD (Product Developer), and the three employees interviewed are named: Project Manager 1, Project Manager 2, and Project Establisher.
Project-characteristics	The goal of the thesis is to identify characteristics of the projects which influence innovation in participating SMEs. Project characteristics refer to mainly two things: characteristics of the funding scheme design which influences the way in which the projects are conducted. This can for example be formalized procedures, guidelines, and requirements. Secondly, projects characteristics can refer to the ways in which the partners choose to collaborate and carry out the projects in practice. The latter will also be referred to as "collaboration form".

Innovation	Innovation is defined differently in the research literature. In this essay I will adapt West and Farr's (1990: 9) definition, and define innovation as " the intentional introduction and application within a role, group, or organization of ideas, processes, products, or procedures new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organization, or wider society". The main reason for choosing this definition is that by "introduction" it includes the creative process of idea generation as part of the innovation process. The definition therefore allows me to investigate factors influencing the creative process of coming up with, and crystallizing ideas. However, the definition does not imply that the idea needs to be new to the world or market. Rather, the idea only needs to be new to the relevant unit of adoption (West & Farr, 1990). This is in line with other scholars who distinguish between *invention*, which is a totally new idea, and *innovation* which is implementation of ideas new to the relevant unit of adaption (e.g., Fagerberg, Mowery, Nelson, 2005; Mowery & Nelson, 2005; Amabile, 1996).

2. The Conceptual Framework

The purpose of the thesis is to analyze specific project characteristics which emerge as influential on innovation in SMEs. This requires an open and explorative research approach. I have therefore chosen to use a variety of theories from different yet overlapping literatures, rather than adhering to a particular research tradition. A drawback of this method is that it limits the space given to in-depth and critical investigation of each particular theory. The following theory chapter will present the conceptual framework, and review the most central concepts used in the thesis. For the sake of avoiding repetition and to provide a closer connection between theory and empirical data, the more specific theories of factors influencing INNOCAP and PROPERF will be woven into the analysis section.

2.1 Key Literature on Innovation Outputs

"Innovation in SMEs" constitutes the dependent variable in this study. It refers to SMEs' innovation output of participating in R&D collaborations through the "Research for SMEs" funding scheme. Research suggests different kinds of innovation outputs of such R&D collaborations.

Some researchers study how collaborations influence firms' capability to innovate at a later point (e.g, Bengtsson, 2007; Lam, 1997; Glazer, 1991; Adams & Dougherty, 1998; Cavusgil et al, 2003; Calantone, Zhao, 2003; Nonaka, 1991). Innovation capability is commonly defined as "the ability to organize and manage the innovation process" (Tidd & Bessant, 2009). Firms' knowledge bases constitute an important ingredient in their innovation capability (Cohen & Levinthal, 1989). Prior studies have supported the hypothesis that firms can acquire new knowledge through collaborations (e.g., Arora & Gambardella 1990; Narula, 2004). Thus, the main focus of this strand of research has been to investigate ways in which firms can increase their innovation capability by acquiring knowledge and competencies from

partner firms through collaborations (e.g., Cavusgil et al, 2003; Narula, 2004; Nonaka, 1991; Lam, 1997; Powell, 1998).

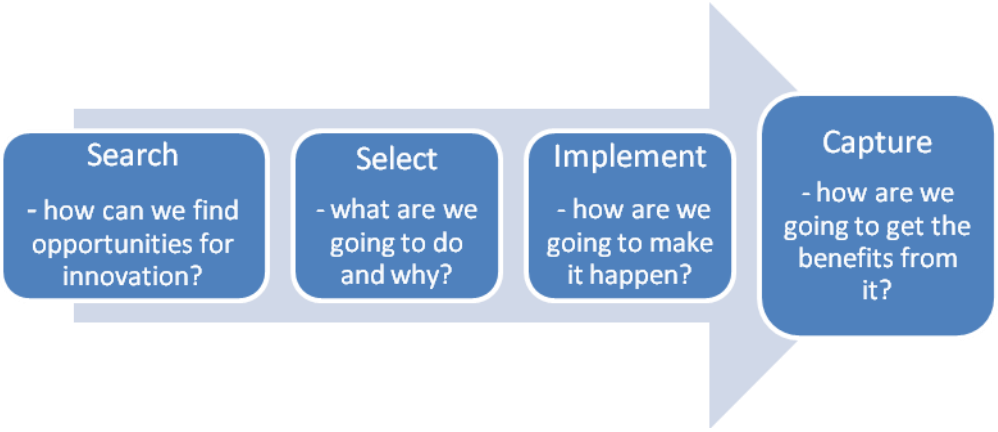
The second bulk of literature addresses ways in which firms can increase innovation project performance through varying methods of collaboration. In comparison, this strand of literature is not concerned with how innovation collaborations influence firms' ability to innovate at a later point. Rather, the focus is on how the project performance itself is influenced by collaboration (this will be discussed further in the PROPERF section below). This stand of research has several areas of attention, such as the effect on product development speed, product quality, market timing of new products, risk sharing, and development cost (see for example Hoel & Wagner (2005) for literature overview).

In this study I investigate the variety of ways in which innovation in SMEs is influenced by participating in the projects. I therefore choose to incorporate both innovation outputs as separate dimensions of my dependent variable (innovation in SMEs). The following sections will further elaborate on the two dimensions and present the indicators used for measurement.

2.2 Innovation Capability

Innovation Capability (INNOCAP) constitutes the first dimensions in my dependent variable (Innovation in SMEs). As mentioned, it refers to "the ability to organize and manage the innovation process" (Tidd & Bessant, 2009: 55). It is important to note that innovation capability refers to firms' ability to manage the entire process since successful innovation depends on success in all phases (Tidd & Bessant, 2009). The innovation process is usually divided into four phases (see fig 2). S*earch* is about finding potential ideas for innovation. *Selection* is the process of choosing a particular idea. *Implementation* is the development of the idea into a concrete innovation (e.g., the product development process). *Capturing* is the

process of reaping the benefits of the idea (e.g., getting people to buy the product). However, it is important to note that this is a simplified model and that innovation usually implies complex feed-back loops between the phases (Tidd & Bessant, 2009).



Figur 2. Simplified model of the innovation process (Tidd & Bessant, 2009). The figure describes the main phases which firms must go through in order to innovate.

The importance of innovation capability was addressed as early as in 1954, when Ducker (1954) stated that firms had to be innovative in order to survive in a volatile environment. In today's markets characterized by increasingly shortened product life cycles, innovation capability is the key for long-term organizational survival and performance (e.g., Damanpour & Evan, 1984; Han et al, 1998; Cavusgil et al, 2003; Menon, Chowdury, & Lukas, 2002). In fact, EU explicitly states that strengthening innovation capability through acquisition of new knowledge is a major goal for the "Research for SMEs" funding scheme (EU Commission, 2010a). Consequently, the study also serves to analyze whether the funding scheme achieves its intended effects.

As mentioned, scholars have argued that knowledge constitutes a main ingredient in firms' innovation capability, and that firms can acquire new knowledge through collaborations (Cavusgil et al, 2003; Arora and Gambardella, 1990, Adams & Dougherty,

1998; Moorman & Rust, 1999). In line with this view, I will assess ways in which SMEs' innovation capability is influenced through investigation of mechanisms for knowledge transfer in the projects. Scholars have developed conceptual frameworks differing between various types of knowledge. In the following section I will briefly describe some knowledge types which are seen as central for firms' innovation capability.

Due to space limitations I will limit the analysis of INNOCAP to mechanisms for transferring *tacit* knowledge. The reason is the broad consensus in the academic literature about the importance of tacit knowledge on firms' innovation capability (e.g., Mowery, Oxley, Silverman, 1996; Nonaka, 1991; Dyer and Singh, 1998; Lam, 1997; Teece, 1988). For example, Cavusgil and colleagues (2003; 7) argue that "tacit knowledge transfer makes a significant contribution for firms to develop great innovation capability". Polanyi (1967) described tacit knowledge as non-verbalizable, intuitive, and unarticulated. It is based on an ontological assumption that "we know more than we can tell" (Polyani, 1967). Simply put, it refers to knowledge which is difficult to codify and transfer. Tacit knowledge is contrasted with explicit knowledge, which is universally accepted, formal, and systematic (Nonaka, 1991). As a result, it can easily be articulated and transferred. It is important to note that knowledge is not either absolute tacit or explicit. Rather, the concepts should be regarded as poles on a continuum, where individual pieces of knowledge can have varying degree of "tacitness" (Inkpen & Dinur, 1998).

2.2.1 Types of Tacit Knowledge

As mentioned, one of the goals of my study is to explore the variety of ways SMEs' innovation capability (INNOCAP) is influenced through mechanisms for tacit knowledge transfer. Some scholars address tacit knowledge in general while others make distinctions between various types of tacit knowledge. I will draw upon these distinctions to make my

research more sensitive to different kinds of tacit knowledge the SME may acquire through the projects. In the following section I will describe the various types of tacit knowledge used as indicators of INNOCAP.

Lundvall and Johnson (1994) made the distinction between two types of tacit knowledge: know-who and know-how. *Know-who* is about knowing who knows what (or knowledge about who knows *how to do* what). Such knowledge is seen as increasingly important due to the dispersed knowledge and skills in today's market (Foray & Lundvall, 1996). I argue that since innovation projects increasingly take on collaborative forms (e.g., Gassman, 2006; Moll, 2005, Powell et al, 1996), know-who knowledge is essential for finding partners with relevant competencies for the project at hand. For this reason acquisition of know-who will constitute the first indicator of INNOCAP.

At a general level, know-how refers to skills or "the capability to do something" (Foray & Lundvall, 1996; 116). Researchers distinguish between various types of know-how (e.g., Simonin, 1997; Teece, 1977; Arora, 1995). Among these, I argue that technological- and collaborative know-how is especially relevant for SMEs' innovation capability. *Collaborative know-how* basically refers to the skills of collaborating efficiently with others and being able to reap the benefits of the collaboration (Simonin, 1997). It is a multifaceted construct, which involves a variety of skills related to the different phases of collaboration cycle. These skills include: identifying and selecting potential collaborators, negotiating the terms and structure of the collaborative agreement, monitoring and managing the collaborative process, and terminating the collaboration (Simonin, 1997). I argue that since innovation projects are done in collaboration with others increasingly more often (e.g., Gassman, 2006; Moll, 2005; Powell et al, 1996), collaborative skills are becoming progressively more important for firms' innovation capability. For instance, Swan and Scarbrough (2005: 913) argue that since "knowledge is becoming widely distributed,

innovation needs to occur at the interstices of collaborating groups and organizations". Acquisition of collaborative know-how therefore constitutes the second indicator of INNOCAP.

Technological know-how refers to a technical, "hands-on" skill of some kind. An example is an experienced craftsman who has developed expertise "at his fingertips", but is rather unable to explicitly formulate the scientific or technical principles behind what he knows (Nonaka, 1991). Technological know-how is especially relevant for firms engaged in new product development activities, since these often require specific technical skills. SME acquisition of technological know-how therefore constitutes the third indicator of INNOCAP. Acquisition of technological know-how is an explicitly stated goal of the "Research for SMEs"-scheme (EU Commission, 2010a). Thus, the inclusion of this indicator also serves to analyze whether the funding scheme meets its intended goals.

2.3 Project Performance

Project Performance (PROPERF) constitutes the second dimension of the dependent variable ("Innovation in SMEs"). PROPERF focuses on ways in which project characteristics influence the actual performance of the consortium during the projects. The underlying rationale for including PROPERF as a dimension in the "Innovation in SMEs" is that high project performance by the consortium will cause positive innovative results for the SME. This is because SMEs had the idea for the product innovation being developed and are the owners of the product. Therefore, they are the ones who will reap the benefits of a potential commercial success.

I will adapt a broad definition of PROPERF in order to make it possible to identify various influencing mechanisms. PROPERF is conceptualized as consisting of two indicators: Product Quality, Product Development Speed (PDS). Thus, project characteristics

influencing these indicators will consequently influence PROPERF. A weakness of PROPERF is that certain project characteristics might have opposite effect on the different indicators (for example between PDS and Product Quality). This issue will be further explored in the analysis section.

Each of the three indicators of PROPERF constitutes a broad field of research. To give an in-depth literature review of each one is beyond the scope of this thesis (for reviews of success factor for product development see Ernst (2002), or Albers (2001)). As mentioned earlier, the more specific theories about the ways in which different factors influence the indicators of PROPERF will be woven into the analysis section. The following section will therefore be limited to definitions of the indicators, as well as arguments for why they constitute important measurements of PROPERF.

2.3.1 Quality

Although everybody more or less knows what quality means, a precise definition has proven difficult to establish. As a result, quality has been defined in numerous ways. In terms of product development, a common characteristic among the definitions is that quality refers to the perception of the degree to which a product fulfills its function. Some authors relate the concept of function to the intended effects by the producers (e.g. Crosby, 1979). In later business and marketing research the function is associated with fulfilling the needs of the customer (ISO 9000, 2005; Box, 1993; Drucker, 1985). Box (1993) argues that such qualities can either be functional (e.g., properties of the material, technical qualities, economic qualities), or "psychological", which are the symbolic meanings the consumer associates with the product (e.g., beauty, prestige, etc.). In this thesis I will adhere to the latter tradition and define quality as "the degree to which a product fulfills its function, given the needs of the consumer" (Box, 1993: 7).

2.3.2 Product Development Speed

Product Development Speed (PDS) constitutes the second indicator of PROPERF. Scholars have emphasized that product development speed is becoming increasingly important (e.g., Powell at al, 1996, Cavusgil et al, 2003). For instance, Menon, Chowdury, and Lukas (2002: 317) argue that:

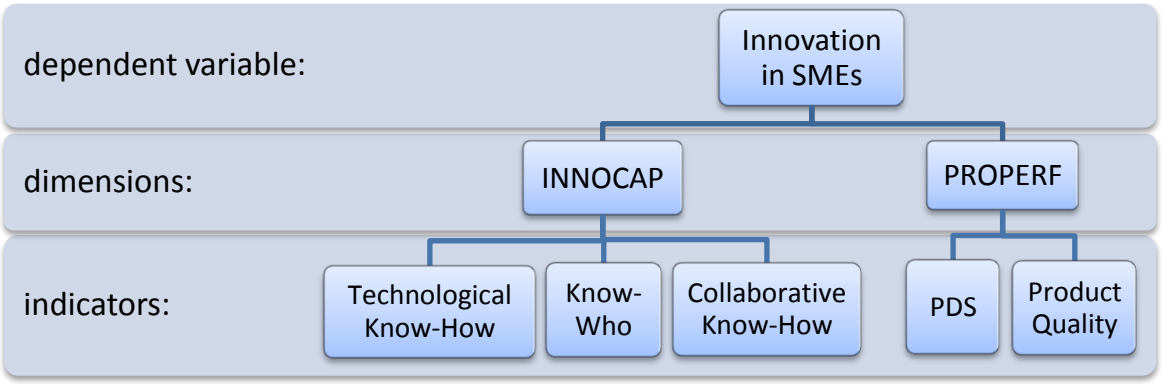
> modern marketplaces are characterized by speedy technological breakthroughs, rapid changes in sociopolitical conditions and consumer tastes, and continuously shrinking product life cycles. Consequently, companies must consider strategies that reduce the time required to take a product from concept to market.

An extensive amount of research identifies and supports the positive effects of developing a new product quickly. Examples of such effects are significant cost reduction, greater market segment coverage, and a dominant leadership role in the marketplace (see Menon and colleagues (2002) for an overview) In the literature PDS has been studied under different headings, such as time-to-market, cycle-time, and time-based competition. In this thesis PDS will be defined as "the pace of activities between idea conception and product implementation" (Menon et al, 2002: 317).

2.4 Summary

In this chapter I have presented the theoretical framework used in the study. "Innovation in SMEs" is conceptualized as consisting of two dimensions: INNOCAP and PROPERF. INNOCAP has three indicators, each measuring transfer of a specific type of tacit knowledge to the SME. The three types of tacit knowledge are: know-who, technological know-how, and collaborative know-how. In addition, some more general theories of tacit knowledge transfer will be used. The two indicators of PROPERF are Product Quality and Product

Development Speed (PDS). Figure 5 graphically illustrates the conceptual framework of the dependent variable. The next chapter will describe the methodology of the study.



Figur 3. Conceptual framework of the dependent variable.

3. Methodology Chapter

3.1 Presentation of Empirical Objects

A total of three projects were analyzed. Due to anonymity of the participants in the study (for reasons which will be elaborated later) the individual projects will now be described briefly. All projects were related to marine technology, ended between 2007 and 2008, and were part of the 6th FP.

- The aim in the Alpha project was to develop a technology for land based fish farming. The product was an automatic degassing method for controlling the level of oxygen in fish tanks. The goal was to increase the survival and growth rate of the fish.
- In the Beta project the main objective was to develop a new net for sea based fish farming aimed at aggressive types of fish species like seabass, seabream and cod. The idea was to develop a stronger and more resistant net which inhibited the aggressive fish types from biting holes and escaping.
- The aim of the Gamma project was to develop a more efficient mussel harvester. The main benefit was to decrease the loss of mussels during harvesting compared to existing technologies.

As mentioned, all of these projects had the same main RTD performer, namely PD. PD is engaged in a variety of business activities. In the early 21st century, the product development department started specializing in utilizing the "Research for SMEs" funding scheme. The business idea is to offer SMEs to write an application to the "Research for SMEs" funding scheme in return for contracting the R&D to PD. PD actively goes out to search for SMEs with innovative ideas for new product development. In fact, in over 95% of SME applications, PD was responsible for finding the SMEs through innovation conferences at the Norwegian Research Council and Yellow Pages, among others (Project Establisher). PD usually has a continuous portfolio of 25-30 projects of this type. It has over two hundred

employees, but the product development department, which is the focus of this thesis, counts just over 30 heads.

3.2 Selecting Cases

TI has several product development teams engaged in various technological fields and industries. I chose to limit my sample of cases to projects within the field of marine technology. In this way, I control for inter-unit differences in PD. The trade-off is that the conclusions cannot be generalized to the whole product development department, as projects might be carried out in different ways by other work-units engaged in other industries/fields of technology. However, the aim of my thesis is not to make statistical generalizations about the characteristics of other R&D projects based on my sample. Instead, the aim is to identify the ways in which certain project characteristics influence innovation in SMEs.

An important criterion when selecting projects was that they had finished some time ago. The reason is that such a time-lag facilitates the evaluation of long-term effects of participation. On the other hand, the projects cannot be conducted too far back in time, as this would hamper the respondents' recollection of how the projects were carried out in practice. As a result of balancing these two considerations, I chose to focus on SMEs that participated in projects which ended between two to three years ago.

All the SME respondents were part of the top management of the companies and acted as the official contact persons in the SMEs to the consortium partners during the projects. Thus, the respondents were the employees with the most knowledge about the ways in which the projects were carried out in practice. Also, top managers are most able to assess the effect of participation on their company (Simonin, 1996). In this way I argue that my respondents constituted the most suitable SME employees to gain insight into the ways in which the projects were carried out and the effect on the SMEs.

3.3 Research Method

The research method used is neither solely inductive nor deductive, but rather a mix of the two approaches. In the following section I will elaborate on the ways in which the research process had both inductive and deductive elements, and explain why such an ”approach-mix” was beneficial for answering my research question.

My approach was partially deductive by basing parts of the semi-structured interviews on existing theories about factors influencing INNOCAP and PROPERF (a more detailed account follows below). Such a deductive approach allowed me to draw upon prior research to identify relevant mechanisms in the projects that influence innovation in SMEs. However, the research process also had strong inductive elements. I showed caution in not only focusing on mechanisms identified in the ex-ante literature review. Rather, I also used an explorative approach to identify new mechanisms. This was accomplished through using flexible semi-structured interviews, and stimulating respondents to speak freely about various project characteristics and their effects on the SME. In contrast, a purely deductive approach would entail only using predetermined variables. This would blindfold my research from identifying new relevant mechanisms. In addition, it would be impossible to assess whether the mechanisms analyzed were the most relevant for understanding the projects’ influence on innovation in the SMEs. The explorative approach during the interviews made it possible, at least to some degree, to identify new mechanisms which emerged as influential on innovation in SMEs. As a result of the inductive elements, the research process was not linear. New theories from the literature were added during the data collection and analysis processes to shed light on new findings. Similarly, theories which proved to have little explanatory value were excluded. As a consequence, the theoretical framework was continuously revised throughout the research process.

Another aspect of my research design involved using a multiple case-study approach. I argue that this approach provides several benefits given my research question. First, it provides rich data to identify how the projects are similar and how they vary. Secondly, having multiple cases also provides rich data to identify varying mechanisms influencing innovation in SMEs. Third, it allows for identification of patterns across cases which helps theory development, and provides a basis for making casual inferences (Eisenhardt, 1989).

3.4 Design of Interview Guide

The mix of inductive and deductive approaches was also reflected in the design of the interview guide. With a deductive approach I identified specific theories about how various ways of collaborating influence factors related to PROPERF and INNOCAP (for instance, how certain ways of organizing the collaboration impede/stimulate motivation or knowledge transfer). Based on these theories I designed questions allowing me to assess whether the ways of collaboration were in line with these theories. At the same time I also included open question about the respondents' own evaluations of how they benefited from the projects (e.g. "What kind of knowledge did you acquire through the project?*")*. In this way, the design facilitated exploration of new project characteristics influencing innovation in SMEs. In addition, I asked the respondents to give their own personal accounts of how the projects were carried out (e.g. "Can you describe how the projects were carried out?"). Such questions were usually asked in the beginning of the interview, before proceeding to more specific questions about the collaboration form. This allowed me to identify new aspects of the collaboration form, which could later be investigated in terms of their effect on the dependent variable.

3.5 Data Collection Procedures

My empirical data was gathered through two types of data collection methods: semi-structured interviews of employees from PD and the SMEs, and written material from the projects such as applications, amendment reports, and final reports. The following section will give a brief summary of the data collection procedures, and discuss the implications of these methods.

First, I started out by reading official documents of the "Research for SMEs" scheme and reports from the individual projects. This gave me basic knowledge about the funding scheme and the projects to be used as the basis for the interviews. I then conducted interviews with three PD employees (Project Establisher, Project Manager 1, Project Manager 2). The interviews provided general information about how the projects varied and how they were similar. It also provided insights into PD's rationale behind conducting the projects in certain ways. In TI, there was a division of labor in the way that some employees were responsible for establishing the projects (Project Establisher) while others were responsible for carrying them out (Project Manager 1, Project Manager 2) . Since my research question is concerned with the whole innovation process, it was necessary to conduct interviews with employees from both functions. Project Manager 1 was the project manager in all three projects under investigation. For this reason I thought he would be prone to social desirability bias by wishing to present his projects in a favorable light. I therefore included Project Manager 2, who was an employee in the electronic department. Project Manager 2 had been engaged in the projects but did not have the overall responsibility. Although Project Manager 2 was included in order to reduce social desirability bias, the occurrence of such bias cannot be totally ruled out.

The next step was the SME interviews. All SME interviews were conducted over the telephone due to long geographical distances. The respondents later got a transcription of the

interviews where they could make corrections or further elaborations. There were some inconsistencies between several of the answers of the SME and the answers of PD. I therefore conducted another interview with PD (Project Establisher) in order to sort out these inconsistencies and raise the reliability of the data. The second interview with PD also gave me the chance to get PD's comments on the new aspects of the arrangement identified during the SME interviews. I later had two other interviews with Project Establisher concerning new questions which emerged when I was analyzing the data. In this way the data analysis and data collection processes was tightly intertwined throughout the research process.

3.6 Data Analysis Procedures

Both INNOCAP and PROPERF are measured using the same method. The empirical material consists of two types of data. "Operation data" refers to information about the ways in which the projects were carried out in practice. It also entails "fact-like" data such as the official papers describing the workings, guidelines, and requirements of the "Research for SMEs" funding scheme. The second type of data is referred to as "perception data". This refers to the respondents' own perceptions and evaluations about the effect of doing things a certain way, or to the degree to which they felt they acquired a specific kind of knowledge, among other things.

In the analysis section operation-data is compared with theories from the academic literature about how various factors influence PROPERF and INNOCAP and inferences are drawn. When appropriate, the perception data from the SME respondents is used to evaluate the relevance of the theory in the particular case. Nevertheless, it is important to note that perception data is particularly prone to bias of different kinds. This will be further discussed in the following section.

3.7 Validity

There is no agreed upon way to address the issue of validity in qualitative research (Creswell, 1994). According to Ragin (1994), validity refers to the appropriateness of the measure - whether it measures what it is supposed to measure. It is common to distinguish between three tests (or types) of validity: construct validity, internal validity, and external validity (e.g., Yin, 2009). In the following section I will briefly discuss the study in light of these three validity tests.

3.7.1 Construct Validity

Construct validity is about "identifying correct operational measures for the concept being studied" (Yin, 2009: 40). In other words, it is concerned with the question of whether our empirical data really measures the concepts they were intended to measure. According to Ragin (1994), the validity of a measure is strengthened by using operational measures which have been used and validated in prior research. In line with this recommendation, the indicators of the two dimensions were identified through prior research. In terms of INNOCAP, there is a broad consensus among scholars that tacit knowledge can be gained through collaboration (Cavusgil et al, 2003), and is an important factor for innovation capability (e.g., Mowery et al, 1996; Dyer and Singh, 1998; Lam, 1997; Teece, 1988). Similarly, the indicators used to assess performance during the project (PROPERF) are also often used by other scholars in addressing performance during R&D projects. Furthermore, the operational measures of the indicators were established by using existing and well researched theories about specific factors influencing the indicators. In addition, construct validity was addressed by using triangulation. This will be further elaborated in the reliability section.

3.7.2 Internal Validity

Internal validity is concerned with how causal relationships are explained, and to what extent the inferences are correct (Yin, 2009). The thesis is explanatory since casual inferences are made about the ways in which project characteristics influence innovation in SMEs. A threat to the casual inferences is that they are partially based on so-called "perception data". Such data is the respondents' own evaluations of the effect of doing things in certain ways. An example of this is the degree to which the respondent felt that the SME acquired a specific kind of knowledge. This poses a threat to the *correctness* of the inferences drawn. The reason is that such evaluations are affected by a variety of factors. As a result, the casual inferences are prone to be spurious, meaning that third variables may influence the response. For instance, prior research has found that knowledge transfer is mediated by the firms' (or respondents') existing relevant knowledge base (Cohen & Levinthal, 1991), intent to learn (Hamel, 1991), and routines and processes for internalizing and exploiting the knowledge (Zara & George, 2005). Therefore, such third variables threaten the internal validity of the inferences as they are partly based on the respondents' own evaluations.

However, I argue that using the respondents' own evaluations as indicators provides a more valid measure in this study compared to other types of measures. For example, innovation capability has been previously measured through patent frequency (Francesco, 2009), R&D spending (Nakamura et al., 1996), and patent data (Silverman, 1996). A weakness of these measures is that they are broad and subjected to many interpretations (Mowery et al, 1996). Since this study only focuses on a small part of the SMEs' total activity, it therefore becomes problematic to infer that variation in such macro-variables is caused by participation in the projects. In comparison, interviewees' evaluations of outcomes provide more focused data about the effects of the projects. In addition, internal validity is addressed by using logic models and explanation building as proposed by Yin (2009).

3.7.3 External Validity

Due to the small and narrow sample, there are no conditions for making statistical generalizations about the existence and frequency of these characteristics occurring in other projects. The thesis constitutes a study of three projects within the field of marine technology involving only SMEs, initiated and managed by a particular working unit of a specific RTD performer, and funded by a certain R&D funding scheme. Consequently, it is reasonable to assume that collaboration projects are carried out differently in other contexts (even in other PD projects). However, the multiple case study approach used here may provide conditions for theoretical generalization (Ragin, 1996)[2]. The theoretical inferences regarding ways in which specific characteristics of the projects affect INNOCAP and PROPERF could be valid in other projects with the same characteristics and can be useful in understanding and evaluating these projects. However, these inferences are not theoretically generalizable by default. To increase their external validity the inferences made in this study must be tested in other collaboration projects with similar characteristics.

3.7.4 Reliability

In social research reliability commonly refers to the degree to which others would arrive at the same conclusions and findings using the procedures described in the study (Yin, 2009).

A threat to reliability was the fact that the projects ended between two and three years ago, which can impede respondents' recollection of how the projects were carried out in practice. This bias was addressed by using *data triangulation* - the use of multiple sources of data (Yin, 2009). For instance, both the SME respondents and the PD respondents were asked to describe ways in which the projects were carried out. Also, I used data from a variety of

[2] Theoretical generalization is also referred to as *analytical generalization* (e.g., Yin, 2009)

written documents produced during the project (e.g., application, amendment reports, final reports). In this way, I was able to identify, and further investigate instances where the different sources of data yielded inconsistent narratives. In this way, the correctness of the "operational data" was addressed. Consequently, triangulation reduces biases, and makes it more likely that other researchers would have gotten the same "picture" about how the projects were conducted. In addition, triangulation also addresses construct validity because it provides multiple measures of the same phenomenon (Yin, 2009).

In order for others to arrive at the same results, the method of data collection should be standardized, neutral and not biased (Mason, 1996). Neutrality was enforced by informing the firms that I was an independent student not working for either EU or PD. In terms of standardization, interview guides are included in the appendix. However, due to my explorative approach the interviews were only partially overlapping in terms of content. Several questions and topics addressed in the interviews are therefore not included in the interview guide. This is a weakness in terms of reliability, but at the same time I strongly believe that it was a necessary choice in order to identify relevant project characteristics influencing innovation in SMEs.

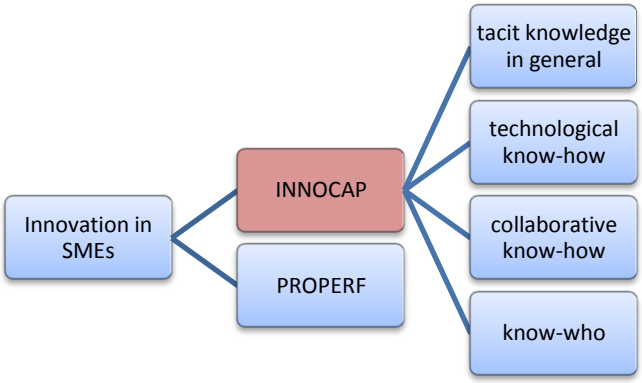
An impediment to reliability was the decision to make participants anonymous because this hampers other researchers' opportunity to replicate the study and test the findings. This decision therefore deserves a short explanation. Since my study investigated ways of carrying out the projects in-depth, there was a concern in PD that the thesis would include sensitive information about their business strategy. Also, there was a concern that some potential findings could cause harm to PD's reputation. My contact person in PD therefore wanted to make the thesis confidential. This involves an application process when handing in the thesis at the University of Oslo. I could therefore not guarantee confidentiality at the time of the interviews. With lack of other alternatives, we therefore came to the

agreement of making the RTD anonymous. Consequently, the projects and the SMEs also had to remain anonymous.

3.8 Ethical Considerations

Several measures were taken to address ethical concerns. When contacting potential participants for interviews, I presented a brief description of myself, the master program, the purpose and relevance of the thesis, and the type of questions I would ask. When conducting the interviews, this information was repeated. I also mentioned that they would remain anonymous in the paper. I informed the SMEs that PD would have knowledge about their participation in this study. After the interviews the participants received a transcription which they could revise. To some degree, the decision to make participants anonymous eased the concern for taking ethical considerations. During the interviews, quite sensitive information was revealed. For instance, certain projects were carried out in ways that were not completely in line with the "Research for SMEs" funding scheme. By making the participants anonymous, such information could be incorporated in the thesis (with the consent of the participants). It was pointed out to the interviewees that the anonymity was primarily enforced by using pseudonyms and not giving detailed descriptions of the participants. However, these measures cannot fully guarantee that no one would be able to recognize them. For instance, there are very few RTD performers who operate the same way as PD. This weakness was pointed out to interviewees. However, PD's main concern was that this thesis could not be found through searching their name in open databases.

4. Innovation Capability – Empirical Findings and Analysis

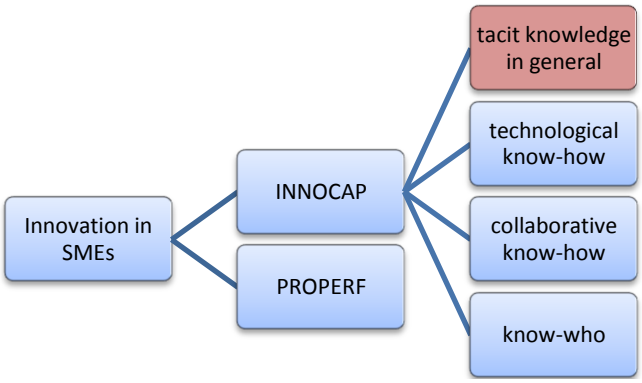


In this chapter I will analyze ways in which specific project characteristics influence the SMEs' innovation capability. The focus is on the kinds of knowledge the firms acquire, since knowledge is seen as a key benefit of collaboration and an important factor behind innovation capability (Arora and Gambardella, 1990). In addition, the EU states that the main purpose of the "Research for SMEs" funding scheme is to increase the innovation capabilities of firms through knowledge transfer (EU commission, 2010b). Thus, this chapter also serves to analyze to what degree and through which mechanisms this goal is accomplished in the projects. Furthermore, analyzing INNOCAP also contributes to knowledge about the long-term effects of R&D funding on recipient firms. Clausen (2007) argue that this is an effect that we hardly know anything about.

As mentioned in the theory chapter, the ways in which project characteristics influence INNOCAP will be measured through indicators of tacit knowledge transfer. Theories of tacit knowledge transfer exist on different levels. Some theories refer to factors influencing tacit knowledge transfer in general, while others are concerned with the transfer of more specific kinds of tacit knowledge. I will structure my analysis accordingly, and start out by analyzing mechanisms influencing tacit knowledge transfer in general. Then I will investigate mechanisms influencing transfer of specific kinds of tacit knowledge including know-who, technological know-how, and collaborative know-how. It is important to note that

the mechanisms analyzed in the "General transfer of tacit knowledge" section also influence the specific types of tacit knowledge analyzed later.

4.1 General Conditions for Transfer of Tacit Knowledge



4.1.1 Frequency and Closeness of Interaction

There is a consensus among scholars that frequent face-to-face contact is important in order for transfer of tacit knowledge to take place (Granovetter, 1973; Cavusgil et al, 2003; Killing, 1983; Teece, 1981). The reason is that tacit knowledge cannot easily be articulated and transferred through written documents, telephone conversations, and e-mail (Nonaka, 1991). Based on this theory, the following section will analyze the conditions for tacit knowledge transfer by investigating the frequency and type of face-to-face interaction between the SMEs and its consortium partners. Also, the SME- respondents' own evaluation of learning outcome from the various types of meetings will be assessed.

EU required the consortium to have three meetings during the course of the project (kick-off meeting, mid-term meeting, and one upon project completion). These "consortium meetings" were the only time all partners met. The main contents of the meetings were progress reports, and presentations of deviations from the original work plan (Alpha, Beta, Project Manager 1). The SMEs reported to gain little valuable knowledge as a result of these meetings. Similarly, Project Manager 2 considered the consortium meetings to be rather

chaotic and having little direct value. However, the SMEs were more positive about the mingling dinners that followed the consortium meetings. The dinners provided a chance for the SMEs to interact more closely with its partners (Alpha, Gamma). For instance, Gamma thought that the mingling dinners were valuable and provided insights into "how companies in other countries within similar industries think". Also, Alpha argued that the dinners gave them knowledge about international organizations' views and perspectives, and ideas about how their own competencies could be of value to firms in other markets. Both SMEs also reported that interacting with international partners through the mingling dinners made them more positive about working with partners abroad, and increased their international focus (Beta had previous international experience). The reported value of the mingling dinners is in line with Jansen and colleagues (2005: 1003) who argue that socialization activities could foster "*connectedness* between partners which encourages communication and improves the efficiency of knowledge exchange throughout units".

In addition, PD tried to arrange "technical meetings" every 6th month. The technical meetings consisted of presentations to all commercial partners in the consortium (including the SME) about the RTDs' work and progress (Project Establisher, Alpha). However, the SMEs reported to have these meetings less than every six months (Gamma, Alpha)[3]. In terms of knowledge acquisition the SMEs did not report the meetings to have much value, except for a general update on the progress of the project.

The SMEs participated in a third kind of meetings which was more informal and spontaneous in nature. These "informal meetings" included only a selection of partners and addressed challenges that emerged during the product development. Beta and Alpha had weak recollection of the exact number of informal meetings, but gave a rough estimate of between 3 and 5 during the course of the project. Gamma reported to not having participated

[3] The SMEs' had a weak recollection of the number of technical meetings, and no documents were found reporting the exact frequency of the meetings in the individual projects.

in any such meetings. According to Alpha, the informal meetings consisted of more in-depth conversations and provided a more efficient arena for learning about partners' competencies, "ways of thinking", and views on current trends. Beta said that they learned more through the informal meetings because they were more focused on specific topics of interest to the SME and allowed them to get to know their partners better compared to the larger meetings.

Lastly, it is worth mentioning that the respondents in my study were the only employees in the SME who had contact with PD and the rest of the consortium. Consequently, knowledge gained from the project was primarily limited to the respondent. The degree to which other employees in the SME acquired knowledge is therefore mediated by the ability of the respondent to absorb and communicate knowledge during the project (Cohen & Levinthal, 1991). It is also mediated by the routines and processes for knowledge diffusion in the SME (Zara & George, 2005).

To summarize, I argue that given the projects' relatively long duration of two years, there was little face-to-face contact between the SMEs and its partners. According to theories emphasizing the importance of frequent face-to-face contact, this impedes transfer of tacit knowledge (e.g., Cavusgil et al, 2003; Granovetter, 1973). Although there were only few meetings, the perception data from the SMEs indicates that some of the meetings succeeded in transferring knowledge with a tacit character such as new "ways-of-thinking", attitudes, perspectives and ideas. Furthermore, a pattern related to the characteristics of these meetings emerged. The more formal meetings, characterized by having many participants and one-way interaction through presentations, were negatively evaluated in terms of learning outcomes (technical meetings and consortium meetings). In contrast, the more informal meetings characterized by in-depth conversations and discussions between few partners were more positively evaluated (informal meetings and mingling dinners).

4.1.2 Participation in Decision Making

Several scholars argue that participating in decision-making facilitates transfer of tacit knowledge. For instance, Hage and Aiken (1967: 14) argue that participation in decision-making functions as "a source for knowledge acquisition for the involved partners as they get insight into other participants' thoughts, ideas, and perspectives on the product development". Participation in decision-making is usually defined as an intra-firm or working unit variable. For instance, Jansen and colleagues (2005) describe it as "involving people from different functional or hierarchal parts in the organization into the decision making process" (p. 1001). Similarly, I will conceptualize the consortium as a working unit, and argue that involvement of the SME in the decision-making process will stimulate acquisition of tacit knowledge.

My empirical data indicated that the SMEs were actively engaged in the decision-making process. According to the official documents, the SMEs are formally the owners of the project, and all the major decisions concerning the product development require its approval (EU Commission, 2010b). In addition, PD stated that they tried to engage the SMEs as much as possible, and would contact the SME whenever there was an important decision to be made about product development (Project Establisher, Project Manager 1). Also, Alpha and Beta reported to be actively involved in a continuous decision-making process: "We had a constant close dialog with PD about which way to go. It was not like PD defined the options, we were also active in the creative phase". Similarly, Alpha said that participating in decision-making with PD provided a way of gaining insight into their way of thinking about product development and innovation, and evaluated this as a very valuable experience. Gamma was an exception by reporting not to have participated in the decision-making process during the project (the reasons will be further discussed in the PROPERF section). The arenas for the SMEs to take part in the decision-making were primarily confined to the informal meetings and contact through telephone and e-mail (Alpha, Beta).

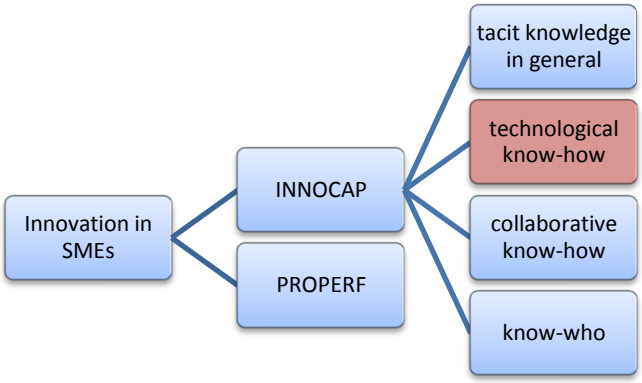
To summarize, participation in decision-making emerged as one of the main activities for the SMEs in the project. The reports from Alpha supported to some degree the assumption among scholars that this can foster transfer of tacit knowledge (e.g., Hage & Aiken, 1967; Jansen et al, 2005).

4.1.3 General Factors for Tacit Knowledge Transfer: Conclusion

In this section I have analyzed the projects in light of two theories about factors influencing tacit knowledge transfer in general. First, I argued that transfer of tacit knowledge was impeded as a result of little face-to-face contact between the SME and its partners. An interesting finding was that although the contact with other partners was limited, the SMEs still reported to gain knowledge of tacit nature. For example, despite only having three meetings with international partners, the SMEs reported gaining insight into their ways of thinking, perspectives, etc. This finding is somewhat contradicting other scholars who emphasize that tacit knowledge takes time to transfer (e.g., Granovetter, 1973; Nonaka, 1991). In contrast, these reports indicate that transfer of tacit knowledge can occur to some degree within a short time. Participation in the decision-making process with PD emerged as one of the main activities of the SMEs. The perception data of knowledge acquisition by the respondents supported existing theories suggesting that this activity can foster transfer of tacit knowledge. As mentioned, theories about tacit knowledge transfer exist on different levels. In the following sections, I will therefore analyze ways in which the projects influenced more specific kinds of tacit knowledge.

4.2 Transfer of Specific Types of Tacit Knowledge

4.2.1 Technological Know-How



Acquisition of technological know-how is both a key factor behind innovation capability (e.g., Teece, 1977; Arora, 1995) and a stated goal of the "Research for SMEs" funding scheme (EU Commission, 2010b). In the following section I will investigate mechanisms in the project which influence SMEs' acquisition of technological know-how.

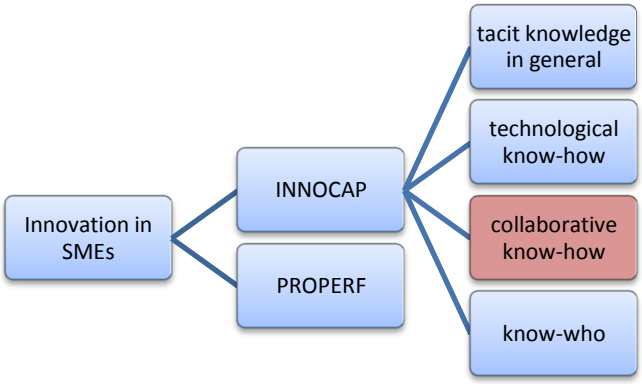
Meetings constituted the only form of face-to-face contact, and none of the hands-on R&D conducted in my cases were done in collaboration. Project Establisher reported that: "In relation to R&D, PD does the "dirty work", we then reports the findings to the SME, which makes decisions about the future direction of the project". This finding is in stark contrast to literature about conditions fostering transfer of technological know-how which stress that such knowledge transfer requires close hands-on collaboration or direct observation of partners performing R&D (e.g., Nelson & Nelson, 2002; Nonaka & Takeuchi, 1995; Nonneman & Vanhouldt, 1996; Killing, 1983; Teece, 1977; Granovetter, 1973)). As there was no direct contact during the actual R&D work performed, there are, according to these theories, no conditions for SME to acquire technological know-how from partners. However, all SMEs in my sample reported to have done some of the R&D in-house. In other words, not all R&D was outsourced to the RTDs, but was in fact conducted partially by the SMEs

themselves. According to absorptive capacity theory (Cohen & Levinthal, 1991) such in-house R&D also produces technological know-how.

Nevertheless, theories point to some important differences between the effects of acquiring technological know-how from partners and producing it in-house. The SME respondents reported to have been given R&D tasks closely related to their core technological competencies. According to Cohen and Levinthal (1991), such in-house R&D stimulates a path-dependent knowledge accumulation process through increased specialization of existing competencies. This finding points to what Mowery and colleagues (1996) describe as a "divergent development" of technological competencies, which refers to alliances where partners become increasingly specialized and the competencies of partners develop in different directions. This is in contrast with "convergent development" which is characterized by knowledge transfer between partners resulting in knowledge bases becoming more alike through collaboration. Quinn and Hilmer (1994) argue that by focusing on core-competencies firms can leverage skills for increased competitiveness. By delegating R&D tasks closely related to their core competencies such a development is stimulated during the projects.

Based on the above analysis of the projects' conditions for transfer of technological know-how, I will make the following conclusions: Since the SME does not collaborate hands-on or monitor the R&D work of the RTDs, there are few conditions facilitating SME acquisition of technological know-how from PD and other partners. However, firms do not simply outsource R&D tasks to RTDs. Because the in-house R&D tasks conducted by the SME are closely related to their core competencies, the arrangement facilitates a more path-dependent specialization of existing competencies in the SMEs (Quinn & Hilmer, 1994; Cohen & Levinthal, 1991). This can be contrasted to acquiring technological know-how in *new* fields through close R&D collaboration with external partners.

4.2.2 Collaborative Know-How



Collaborative know-how refers to the skills of collaborating efficiently with others and managing to reap the benefits of the collaboration (Simonin, 1997). Collaborative experience is fundamental for building collaborative know-how (Simonin, 1997). For instance, Hill and Hellriegel (1994) concluded that the lower-than-average failure rate of joint ventures observed in the U.S oil industry can be attributed to the fact that managers have learned the essentials of collaboration through experience. Similarly, Salk and Simonin (2003) argue that by taking part in R&D alliances firms learn to manage their partner relations and networks. This increases their ability to take a more central position in, and better utilize, future alliances (Salk & Simonin, 2003). Since innovation is increasingly becoming a multi- player game (Quinn, 2000), I argue that firms' innovation capability is increasingly more affected by their collaborative know-how.

Since there are many types of collaborations, the collaborative know-how gained from an alliance is, to some degree, specific to the characteristics of the collaborative form (Jansen et al, 2005). Ways in which these projects deviate from the SMEs' former collaboration projects will therefore indicate what kind of new collaborative know-how they gain through participation. The most notable deviation was that none of the SMEs had prior experience with R&D projects of this magnitude. In all cases the SME emphasized that the project was

the largest they had ever participated in, both in financial terms and in the number of partners. Alpha saw the size of the project as a challenge, but at the same time reported that it gave a valuable experience. Second, the projects' duration of two years were longer than the SMEs' prior R&D projects, which were mostly shorter-term incremental innovations projects on existing products (Gamma, Beta). Third, in all cases except Beta, the SMEs had no prior experience collaborating with international partners. Both Alpha and Gamma commented this as a valuable experience that contributed to the increase of their international focus. Project Manager 1 argued that this was a general characteristic in the projects: "Several of the SMEs emphasize the benefits of establishing international contacts. This provides a gate-way to new international markets, and acquisition of international experience by communicating with international actors". In light of the increasing globalization of markets and collaboration across national boundaries, such experience can be regarded as a valuable form of collaborative know-how. Fourth, Alpha and Gamma said that the projects were more multidisciplinary than their prior R&D projects. According to Project Manager 2, this was a common characteristic of PD's projects:

> a general characteristic of the projects is that they are more multidisciplinary than what the SMBs usually do. A strength of PD is that we have competencies in several fields, and we can use several of our competencies in the individual projects.

Lastly, Alpha and Beta pointed out that the innovation was more risky and more novel compared to their own projects. These deviations from the SMEs' prior collaborative projects provide new collaborative experiences which, according to Jansen and colleagues (2005), enable acquisition of new collaborative know-how.

On the other side, collaborative know-how is not only influenced by the general characteristics of the projects. It also depends on ways in which the projects were carried out in practice. As mentioned in the theory chapter, Simonin (1997) defines collaborative know-

how as skills in doing four distinct activities, which will be further discussed in the next paragraph. I argue that since collaborative know-how is gained through experience (Simonin, 1997; Salk & Simonin, 2003; Jansen et al, 2005), the degree to which the SMEs participated in these specific activities influences their acquisition of collaborative know-how. In order to assess SME acquisition of collaborative know-how I will list these activities and analyze the degree to which the SMEs were involved in them in the following section.

According to Simonin (1997), collaborative know-how includes identifying and selecting potential collaborators. In the process of establishing a consortium PD encourages the SME to contact any existing partners that might be of relevance to the project at hand. In this way, the SME gets some experience in identifying and screening potential collaborators. When the SME has picked out its relevant partners, PD uses its network to find the remaining partners in order to fulfill the requirements of the EU (three SMEs and two RTDs from different European countries). Thus, the SME does not get challenged to actively search and select *new* partners. Rather, they utilize the know-who knowledge of PD to fill the missing spots. An exception was Alpha who actively went outside of their existing network to identify new relevant partners for the project.

Secondly, collaborative know-how entails the skills of negotiating the terms and structure of the collaborative agreement (Simonin, 1997). In this case the SMEs also made use of PD's prior experience as PD made the proposal and negotiated the terms of engagement with the other partners. However, through updates from TI, the SMEs did get insight into how such an agreement can be designed and what should be taken into considerations in this process (Alpha).

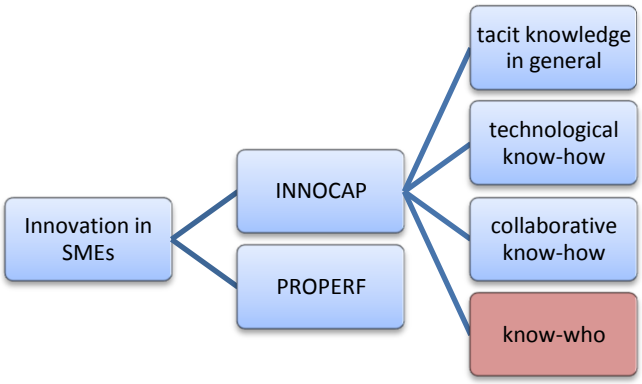
Third, collaborative know-how entails the skills of monitoring and managing the collaboration process (Simonin, 1997). Here, the delegation of the coordinator role to PD was influential. As the official coordinator, PD had the responsibility of monitoring the

compliance of partners, and in general coordinated and managed the project. Consequently, the SMEs did not gain much experience in project management or monitoring partners.

Lastly, Simonin (1997) stresses that collaborative know-how is concerned with knowing when to terminate the collaboration. Since the "Research for SMEs" has a set timeframe, this was not of any concern for the SME. Thus, they gained no experience evaluating when the collaboration should be terminated.

To sum up, the SMEs' acquisition of collaborative know-how points in different directions depending on the focus of the analysis. When analyzing the characteristics of the project, the results indicate that the project deviated from the SMEs' prior experience in several ways. The most common characteristics in my sample were the size of the project in terms of finance and partners involved, and the involvement of international actors. According to Salk and Simonin (2003) such experiences would increase the SMEs' ability to manage and utilize similar collaborations in the future. However, when analyzing how the project was carried out in practice, the SMEs seemed to gain only modest experience. This is mainly attributed to the delegation of coordinator tasks to PD.

4.2.3 Know-Who



Know-who is about knowing who has what kind of competencies and knowledge bases (Lundvall & Johnson, 1994). I argue that since innovation projects increasingly are done in

collaborations (Quinn, 2000), a firms' innovation capability is increasingly influenced by their ability to find the right partners with complementary knowledge and skills for the project at hand. How does the project facilitate acquisition of know-who? In order to get funding from EU, a consortium must be established consisting of at least three SMEs and two RTDs from different countries in Europe. In addition, PD strives to put together a consortium that constitutes a complete value chain. These requirements and initiatives result in the consortium consisting of many partners that the SME can get acquainted with. As mentioned, PD actively assists the SMEs in finding new partners by using its own network. This assistance is essential given that the SMEs usually have a limited network and resources available to conduct a partner search (Alpha, Project Establisher). However, in order to increase their know-who, mechanisms that allow the SME to get to know the partners must be established. The three consortium meetings and the following mingling dinners were the main forms of contact between the SMEs and the international partners. The technical and informal meetings constituted mechanisms by which the SMEs got know-who knowledge about the partners PD picked. Although, the contact between SMEs and other partners was relatively low, both Alpha and Beta reported to acquire know-who during the projects. For instance, Alpha reported: "Yes, we had good knowledge about our partners' competencies. We did, after all, decide which partners to include based on their competencies, and during the project we gained even more insight about their competencies".

On the other hand, after the project ended the SME did not have any further collaboration with the partners PD picked. This could serve as an indicator that the new know-who acquired was of little value to the SMEs in my sample. However, Narula (1999) argues that most collaborations do not result in further alliances. The lack of collaboration spin-offs from the projects may therefore be expected due to the small sample in my study. Also, new collaborations may happen sometime in the future. My study does, to some extent,

control for such long-term effects by sampling projects which ended between two and three years ago. However, circumstances could change, and old partners could become relevant again. Another potential reason for why there was so little contact was that none of the projects resulted in commercialization attempts. One of the main purposes of the consortium was to assist the SME in the later production and commercialization phase. Because this phase was not reached, it is somewhat natural that the contact did not continue after project end.

To conclude, EU's requirement to include international organizations, and PD's emphasis on creating a value chain contributed to the establishment of large consortiums (compared to the SMEs' prior collaborative projects). This, in turn, facilitated conditions for SMEs to get new acquaintances and thereby acquire new know-who knowledge. The analysis indicated that the frequency of contact between the SMEs and their partners mediated the degree to which the SMEs actually acquired know-who about them. The value of the acquired know-who was evaluated as low because none of the SMEs had any contact with new partners after the project ended. However, the latter can be explained by the fact that none of the product innovations resulted in commercialization. Consequently, the commercial partners were of little interest after the project.

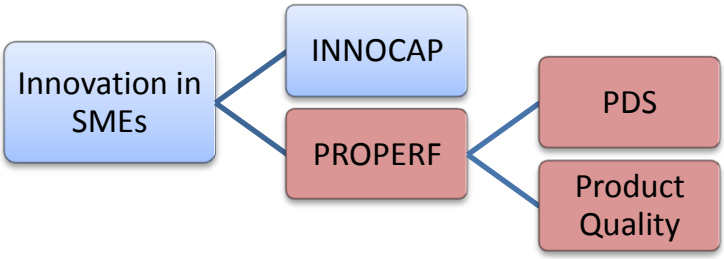
4.3 Conclusion INNOCAP

In this chapter I have investigated ways in which the project characteristics influenced innovation capability of the participating SMEs. The focus has been on tacit knowledge transfer since such knowledge is central to firms' ability to innovate (e.g., Arora and Gambardella, 1990; Cavusgil et al, 2003).

Briefly summarized, the empirical data indicated that there was relatively little contact between the SMEs and the consortium partners. Although existing theories of tacit

knowledge transfer stress that close and frequent contact over time is an important requirement (e.g., Granovetter, 1973; Cavusgil et al, 2003; Teece, 1981), the SMEs still gave reports indicating that they did acquire some knowledge of tacit nature. However, the following analysis of specific types of tacit knowledge transfer indicated that although some project characteristics facilitated tacit knowledge transfer, the lack of contact impeded the overall acquisition. For instance, the analysis indicated that the projects provided good conditions for acquisition of know-who by establishing large consortiums with many partners new to the SMEs. However, the low degree of contact between the SME and its partners during the project emerged as a negative influence on the net acquisition of such knowledge. Similarly, the projects facilitated conditions for acquiring new collaborative know-how by deviating in many ways from the SMEs' prior collaborative experiences. However, the SMEs were little engaged in actual collaboration activities which impeded the SMEs' acquisition of collaborative know-how. The findings do support existing theories that close and frequent contact is important for transfer of tacit knowledge. However, the respondents' reports indicate that tacit knowledge, like new perspectives and ways of thinking, can be transferred to some degree within a short time.

5. Project Performance – Empirical Findings and Analysis



This chapter will investigate project characteristics influencing the consortiums' performance during the projects (PROPERF). PROPERF is measured through two indicators: Product Quality and Product Development Speed (PDS). In the INNOCAP chapter I analyzed ways in which the projects influenced the *SMEs'* ability to innovate *after* the project. In contrast, PROPERF is concerned with mechanisms influencing the *consortiums'* innovation performance *during* the projects. It is a highly complex dimension, influenced by a variety of factors. To analyze all project characteristics influencing PROPERF is beyond the scope of this paper. I will therefore limit this section to analyze a selection of project characteristics which, in the course of the research process, emerged as having a particularly large influence on the PROPERF indicators.

This analysis is structured differently than INNOCAP. The three indicators will not be analyzed in turn. Rather, each section will analyze the project in light of theories which, according to research, can influence on both indicators at once. First, I will empirically investigate the ways in which partners managed to make use of each other's competencies. Then, the effects of active involvement in the decision-making process will be analyzed. Lastly, I will investigate factors influencing the motivation and commitment of partners, followed by analysis of project characteristics influencing flexibility.

5.1 Accessing Consortium Partners' Knowledge

In the INNOCAP chapter I analyzed ways in which the SMEs acquired knowledge from their partners through the project. However, scholars argue that firms sometimes enter alliances in order to *access* rather than *acquire* the competencies and knowledge of their partners (Grant and Baden-Fuller, 1995; Nakamura, Shaver, and Yeung, 1996; Mowery et al, 1996). This implies that the firms do not learn partners' competencies, but rather *make use* of them during the project as a way to compensate for their own lacking competencies (Cook, 1991; Mowery et all, 1996). In this section I will analyze in what way, and to what degree, the consortium partners managed to make use of each other's competencies and knowledge by delegating tasks to those best suited for the job. In line with the INNOCAP section the three competencies analyzed are know-who. technological know-how, and collaborative know-how.

5.1.1 Accessing Know-Who.

An important factor for PROPERF is establishing a consortium of competent and motivated partners. As mentioned, know-who refers to knowledge about who has what competencies (Lundvall & Johnson, 1994). No two organizations have an identical network and know-who. Thus, one way of stimulating PROPERF is having procedures that enable PD and the SME to make use of each other's know-who to establish the most competent consortium possible. First, I will assess how PD's and the SMEs' know-who differ. Secondly, I will investigate in what ways, and to what degree they managed to make use of each other's know-who.

Project Manager 2 argued that PD "has an extensive international network and knowledge about European RTDs and their competencies". Such know-who was largely lacking in the SMEs. For instance, Alpha said: "Who knows about the different research institutions in Europe and what their competencies are? An SME doesn't know this. They do

not have a large international network". In contrast, both PD and the SMEs reported that the SMEs had more knowledge about relevant partners within the specific industry, such as suppliers and end-users. In addition, the SMEs had know-who of other firms with more detailed market knowledge related to the product idea (Project Manager 1, Alpha, Beta).

In what way did PD and the SMEs managed to make use of each other's know-who? The projects in my sample all had the same routine for consortium establishment. First, PD asked the SME whether they had any relevant partners that they want to include in the consortium. PD then used its own network (or know-who) to find missing partners in order to establish a value chain and satisfy the requirements of EU (three SMEs and two RTDs from different member states or associated countries). A review of which organizations the SMEs and PD were responsible for including in the consortiums largely confirmed the respondents' answers. In all cases PD found the RTDs and the international partners. The SMEs' contributions were mainly in terms of other firms within the relevant market such as end-users and suppliers.

It is worth noting that Alpha reported that earlier projects were characterized by PD picking out the partners for the consortium. In this way PD did not make use of the SME's know-who. Alpha reported that these projects turned out badly, and often led to the inclusion of irrelevant partners for the project at hand. In contrast, all SMEs in my sample reported that they managed to establish a good value chain in the consortium. This gives further support to the inference that accessing each other's know-who can improve PROPERF by identifying more competent and relevant partners for the given project.

The above findings suggest that PD and the SMEs possessed complementary know-who for the project at hand. Furthermore, routines that facilitated PD and the SME to make use of each other's know-who were established. This, I argue, positively influences PROPERF by facilitating the establishment of a consortium with relevant competencies for

the project. To the best of my knowledge, no literature has addressed the benefits of making use of other's know-who (instead of acquiring know-who through internalization). The analysis therefore complements existing literature by suggesting that using each other's know-who in the establishment of collaboration projects can result in identification of more competent partners.

5.1.2 Accessing Technological Know-How

Similarly to know-who, the PDS and Product Quality can be stimulated by allocating R&D work to the consortium partners with the most relevant technological know-how. First, I will investigate which partners had the most relevant technological know-how. Second, I will analyze the degree to which the R&D tasks were delegated to those partners.

The intention behind the funding scheme is that SMEs with lacking technological competencies sub-contract R&D to RTD performers. Thus, it is reasonable to assume that the RTDs have the most relevant technological know-how out of the consortium partners. However, the empirical data pointed in a somewhat opposite direction. For instance, Gamma argued that "TI did not have a clue when it came to doing the product development - that was my impression". Similarly, Alpha reported that "the product development was related to such narrow field of technology that PD did not possess the necessary competencies in this field. We did most of the R&D ourselves, together with a partner firm and another international RTD performer". However, Beta evaluated PD as being a competent partner in doing the R&D tasks. These reports suggest that the projects vary in terms of which partner possessed the relevant technological know-how. Consequently, PROPERF will benefit from having flexibility in terms of adjusting the delegation of R&D tasks to the most competent partner. However, the requirements for the "Research for SMEs" funding scheme are quite rigid on this aspect. Official papers emphasize the outsourcing character of the projects by stressing

that “research and development activities of the RTD performer should form the bulk of the project, assessed in terms of activities and resources deployed” (EU Commission, 2010b; 5). Furthermore, Project Establisher said that on average approximately 90% of the total funding is given to the RTDs to perform R&D. Based on these findings I argue that this requirement by EU will function as a barrier of allocating R&D tasks to the most competent partners. Despite these rigid requirements from the EU, the projects were far more flexible in practice. As mentioned, all SMEs were involved in the R&D work to some degree. Gamma reported to have developed the main component for the mussel harvester in-house. Similarly, Alpha also reported that the R&D was conducted by themselves, a partner company, and an international RTD. In contrast, Beta reported that PD conducted the majority of R&D. The existence of such flexibility was also supported by Project Manager 2 who said that “the degree of cooperation depends on the fit between the SME’s competencies and the nature of the project. In cases with a good fit it is natural to have a closer collaboration on the technical part”. Based on these findings I argue that the consortium managed to make use of each other’s technical competencies well.

To summarize, the analysis suggests that the projects vary with regard to which partners possessed the relevant technological know-how for the project at hand. For this reason, the consortiums must be flexible in the delegation of R&D tasks in order to make use of each other’s competencies. The “Research for SMEs” funding scheme impeded such flexibility by requiring that the large majority of funding should be used by the SMEs to outsource R&D to RTD performers. Despite such rigid requirements, the empirical findings suggested that the projects were flexible in practice by delegating R&D work to those partners with the most relevant technological competencies.

5.1.3 Accessing Collaborative Know-How

Researchers have emphasized that knowledge of how to collaborate with others is essential for success in collaborative projects (Hellriegel, 1994; Harrigan, 1988). Collaborative know-how is seen primarily as a result of firms' prior collaborative experience (Simonin, 1997; Hellriegel, 1994). In the INNOCAP section I analyzed project characteristics that facilitate SMEs' acquisition of collaborative know-how. In this section the focus will be on the ways in which the consortium managed to utilize the partners' collaborative know-how to stimulate Product Quality and PDS.

When analyzing ways in which the consortium made use of partners' collaborative know-how, the delegation of the coordinator role emerged as an important factor. By matching the abilities associated with collaborative know-how with the responsibilities of the coordinator role, it becomes apparent that the collaborative know-how is essential for performing as a coordinator. For instance, Simonin (1997) links collaborative know-how to the ability to monitor the partners and manage an ongoing collaboration. Similarly, the coordinator role entails acting as the project manager and monitoring the compliance of partners. Collaborative know-how is also related to communication skills (Simonin, 1997). This fits with the coordinator role which, according to the funding program's official documents, is responsible for "efficient and correct communication between participants, and reporting regularly to participants and to the (EU) Commission on the progress of the project" (EU Commission, 2010b: 2). Consequently, the project will benefit from delegating the coordinator role to the partner with the most relevant collaborative know-how.

Which consortium partner had most relevant collaborative know-how? PD has over ten years of experience acting as a coordinator in the large majority of their projects (Project Establisher). In light of scholars stressing that collaborative know-how is as a result of prior experience (Simonin, 1997; Hellriegel, 1994), it is reasonable to assume that they have thus

accumulated extensive collaborative know-how through the years. Also, Jansen and colleagues (2005) emphasize that collaborative know-how gained through experience is conditioned to the specific type of collaborations they have previously participated in. As mentioned in the INNOCAP section, the SMEs had never before participated in the "Research for SMEs" funding scheme, and the project deviated from the SMEs' prior collaborative experiences in many ways (e.g., number of partners, financial size, risk, international participation). Based on these two findings I will argue that PD was significantly more qualified to take on the role of coordinator.

However, the SMEs were automatically given the role of coordinator by the EU because they were the official owners of the project (Project Establisher). A partial reason for this is that the EU wants the SMEs to acquire collaborative experience and extend their network through interaction with new organizations (EU Commission, 2010a). Although the SMEs were the official coordinators, Project Establisher reported that it is "TI who does the coordinator task de facto". In fact, the SMEs did not report to do any of the tasks associated with being the coordinator. PD wrote the applications and the required reports to EU throughout the duration of the project. They also had the overall management of the project, and were the primary point of contact for the partners. For instance, Project Manager 1 described the communication flows in the consortium as a wheel with PD as the nave. Similarly, all SMEs reported little contact with other partners beside PD. In this way, the consortium did utilize PD's collaborative know-how, despite the fact that the SMEs were the official coordinators. Project Establisher supported the hypothesis that this arrangement increased PDS in the projects:

> It would never work in practice if, for instance, Gamma or some other small SME were to act as the coordinator. If we had not been the coordinator, the projects would have stalled. EU has a naive perception that the SMEs should do this. That would have implied that the SMEs would have to acquire detailed knowledge of financial guidelines and lots of other stuff that they would never

> have the time to adequately understand, and probably never use again. We have extensive experience in these types of collaborations and do this task (coordinator) elegantly and efficiently.

To summarize, collaborative know-how is essential for performing the coordinator role. The analysis indicated that PD had the most relevant collaborative know-how since they had participated in, and acted as a coordinator in similar projects for over 10 years. Still, the SMEs were given the role of coordinator by the EU, although PD acted as the coordinator in practice. In this way, the consortium managed to make use of the partner with the most relevant collaborative know-how.

5.1.4 Accessing Competencies: Conclusion

The analysis points towards consortium partners arranging the work in a way that made them utilize each other's competencies to increase PROPERF. The consortium managed to make use of PD's extensive collaborative know-how. This was achieved by having PD act as a coordinator despite the fact that the SME was officially delegated the role. The consortiums were also flexible in allocating the R&D tasks to the partners with the most relevant technological know-how. For example, in all my cases the SMEs were engaged in R&D related to their core competencies. In the project establishment, both the SME and PD included partners from their existing network into the consortium. In this way, they managed to utilize each other's know-who.

5.2 Participation in Decision-Making

As mentioned in the INNOCAP section, both Alpha and Beta reported to be actively engaged in the decision-making process. The analysis suggested that this functioned as a mechanism for transfer of tacit knowledge from PD to the SMEs. In relation to the effect of participation in decision-making on Product Quality and PDS, research has suggested that it can influence

the two indicators in opposite ways. In the following section, I will analyze the degree to which involvement in decision making influenced PDS and the quality of ideas and decisions.

Several studies have supported the hypothesis that participation in decision-making can slow down PDS (e.g., Jansen et al, 2005; Zaltman, Duncan, & Holbek, 1973). For instance, Cardinal (2001) found that participation in decision-making can hamper information processing efficiency. Similarly, Atuahene-Gima (2003) found that it can increase difficulties in gaining consensus. As mentioned, both Beta and Alpha reported to be actively engaged in the decision-making process. Based on this literature it is therefore reasonable to assume that the active engagement of various partners in the decision-making process could potentially have negative effect on PDS in these projects. The empirical findings supported this hypothesis to some extent. Beta was the SME that reported the strongest degree of participation in the decision-making: "It was a constant dialog about which way to go between the partners in the consortium. It was not like PD defined the options, we were also creatively engaged in the decision-making process". In line with existent literature, Beta also reported difficulties gaining consensus during the project. One point of disagreement was that some partners wanted to use copper in the new fish net they developed. This led to disagreement in the consortium, since Beta and other partners did not support this decision (Beta). According to Beta, this issue took time to solve and consequently slowed down the product development process. Also, Project Manager 2 said that difficulties in gaining consensus were a recurring challenge in many of PD's projects:

> It can sometimes be problematic to get acceptance for the solutions the RTDs think are the best. When we favor a particular solution we have a reason for it, but the SME does not always have the necessary competencies to understand why this is the best solution ….Although they usually agree with us in the end, this can be a resource consuming task.

The comment also points to the SME's relevant competencies as a mediating variable of the effect of participation in decision-making on PDS.

On the other side, scholars stress that participation in decision-making can have positive effects on the quality of ideas and proposals (e.g., Jansen et al, 2005; Sheremata, 2000; Hage & Aiken, 1967; Pierce & Delbecq, 1977). Similarly, Zaltman and colleagues (1973) argue that participation in decision-making facilitates the initiation of innovative behavior. In the empirical findings I found some support for these theories. When PD first contacted the SMEs, the product idea was developed to varying degrees. Project Manager 1 said that the ideas could vary from what he called the "napkin-stage", which were very loose ideas, to SMEs with detailed descriptions of the idea and ways of developing it. In the Beta and Alpha cases, the ideas were further developed in cooperation with TI[4]. Both SMEs reported that this process improved the quality of the initial product idea.

To conclude, the findings point to participation in decision-making as influencing the indicators of PROPERF in opposite ways. The Beta case and comments from Project Manager 2 pointed towards participation in decision-making as a factor hampering PDS by creating difficulties of gaining consensus. On the other hand, my empirical findings indicate that participation in decision-making increases the quality of product ideas.

5.3 Motivation and Commitment

Partners' motivation and commitment to the project is seen as a crucial factor for success for new product development (Holger, 2002), and for work performance in general (McGregor, 1960). This section will investigate project characteristics that emerged during the research process as having an influence on the motivation and commitment of the consortium members.

[4] In the Gamma case the PD had the idea for the new product, this will be elaborated and discussed further in the following sections.

5.3.1 SMEs' Motivation and Commitment

According to McGregor's (1960) "theory Y" employees will be more motivated and will consequently work better if they are committed to their work. I argue that this theory is also valid for firms participating in collaboration projects. Similarly, PD argued that this constituted a major priority for them when deciding whom to cooperate with (Project Establisher). Although, this selection criterion should act as a mechanism for promoting cooperation with motivated SMEs, the empirical data suggests that this was accomplished to varying degree in practice. In the Gamma project, one of the main reasons for decreased SME motivation was the fact that TI, and not the SME, generated the idea for the new product: "It was not us who had the product idea. Two guys from PD worked out the idea, and asked us to participate" (Gamma). In this way, the SME was not initially motivated for the idea. In order to motivate the SMEs, PD therefore needed to communicate the nature of their idea to Gamma, and convince them of the idea's commercial potential. However, the empirical findings suggest that PD failed in this task. The Gamma respondent reported that they did not really understand why PD wanted to do this project in the first place since the product, in his eyes, did not represent an improvement compared to existing technology. Nevertheless they chose to participate in order to "be nice" to PD (Gamma). The lack of motivation was also supported through comments like: "To tell the truth I was actually pissed off at the whole project". The inference that PD- initiated projects hampered SME commitment was also inversely supported in the Beta and Alpha projects. In both cases, the SMEs had the product idea, and reported to be committed to the project.

The Alpha respondent, who had participated in several PD projects, confirmed the hypothesis that PD-initiated projects reduced commitment: "I have been involved in projects where PD basically had the idea, and the SME did not even seem interested in the product development. These projects turned out badly". This comment also indicates that the Gamma

case was not a one-time occurrence and that PD had initiated projects based on own ideas in other instances. It is worth mentioning that Project Establisher reported that PD also had negative experiences when the projects where based on their own product idea. As a result, they have now stopped this practice.

5.3.2 Economic Factors for Motivation and Work Performance

Taylor (1911) put forward the idea that workers are motivated solely by monetary rewards. Performance is therefore fostered by paying workers accordingly. This hypothesis is based on the assumption that workers are generally egoistic and dislike work. In line with later critics (e.g., McGregor, 1960), I will assume that other factors are essential to motivation as well. However, I argue that financial reward do, to some degree, constitute a motivational factor for increased work performance. In light of Taylor's theory, the following section will investigate the ways in which the consortium partners' motivation was influenced by the payment arrangement in the projects.

The SMEs receive the large majority of their funding in the beginning of the project (70% in the beginning and 30% halfway through (Project Establisher)). Based on the delegation of work described in the initial work plan, the consortium members were paid in the beginning of the project. The payment was based on the agreed upon value of the work they were delegated (Project Establisher, Alpha). In contrast to normal business relations, consortium partners were therefore paid before they did the job. According to Taylor (1911), the consortium partners would consequently lack motivation to perform the upcoming job since they had already received the payment. This prediction was supported by Alpha: "Economic initiatives for partners to perform were lacking in the project. One problem was that partners got paid before they did the job. This is upside-down compared to how business usually is conducted". Similarly, the Alpha respondent argued that "A drawback in the

projects is that the partners risk little if they did a bad job since they already got paid". According to Alpha, this resulted in reduced work performance and delayed deliveries by some partners. In the Alpha respondent's current project with PD (also part of the "Research for SMEs" funding scheme) they have changed this practice, and now hold the payment back until the partners have delivered their service or product of the desired quality at the agreed upon time. In fact, they have refused to pay a partner who has failed to deliver a sub-component of sufficient quality. Alpha also reported that another partner significantly improved their performance as a result of threats to hold back the money if the quality was not satisfactory. I believe that such observed changes in work performance as a result of implementing payment after delivery indicate that paying beforehand reduces both Product Quality and PDS.

Although payment is given in advance, it does not preclude the possibility of demanding refund if the partners do not perform. However, this would entail a more time- and resource-consuming task compared to simply not paying.

The above analysis focused on economic initiatives for *the consortium partners* to perform. In light of Taylor's theory, I argue that certain aspects of the projects may also impede economic initiatives for PD to perform at its best. Since the SMEs have the Intellectual Property Rights (IPR) of the product, PD will not reap the benefits from a potential successful commercialization of the product. As with the other partners in the consortium, their income is solely based on funding from the EU. Consequently, the quality of work in the product development will not have any direct economic impact on PD. According to Taylor (1911), this should hamper PD's motivation to perform to the best of its ability after funding is granted. My empirical findings partly supported this hypothesis. For instance, Alpha reported that "TI definitely had their strength in writing applications, but the real job starts when the application is approved. I had a feeling that PD felt the job was done

when we received the funding". Gamma had a similar view by commenting that "They (TI) were mostly concerned with getting funding from EU". However, my empirical findings were not one-sided. Beta evaluated PD to be a motivated and competent partner. Alpha also stated that he thought PD had improved significantly in the later projects they have participated in. When confronted with this potential lack of motivation due to the IPR arrangement in the projects, PD stressed that they were both motivated and economically dependent on the success of the projects. The reason given was that PD needed to have successful projects in order to attract new SMEs (Project Manager 1, Project Manager 2). However, I argue that this motivational factor does not necessarily guarantee top performance by PD in every project. Rather, it implies that PD is dependent on having *some* successful projects which they can use to attract new SMEs. The importance of having some successful projects could act as a motivational factor to perform in promising projects, but does not apply to projects which are, or turn out to be, less promising. The reported lack of PD commitment in the Gamma project ("They were mostly concerned with getting funding from EU") supports this hypothesis. My interpretation of this was that PD realized during the course of product development that there was no demand for the product, and therefore did not have commercial interest (this will be addressed in the next section).

During the interviews the PD respondents (Project Establisher and Project Manager 2) pointed out another economic mechanism which they argued motivated them to perform. EU requires PD and the other partners to invoice every hour of their work. If the partners cannot document their work they would have to pay back the received funding. I argue that this mechanism also does not foster top performance, although it does inhibit PD from performing below a certain standard. This view was indirectly supported by Project Manager 2 who said: "we cannot sit and play Playstation all the time, we have to perform in order not to get the initial funding withdrawn". A potential request to withdraw funding that has already been

spent by the partners would only happen in serious instances of underperformance. In this way I argue that it only constitutes a mechanism of preventing severe underperformance.

5.3.3 Motivation and Commitment: Conclusion

The analysis indicated that several mechanisms in the projects inhibit consortium partners' motivation to perform. In the case of Gamma, PD initiated the project based on their own idea. The empirical findings indicated that this negatively influenced the SME's motivation and work performance. In terms of motivation through payment arrangements, the analysis indicated that some mechanisms impeded motivation, while others ensured that performance would not to fall below a certain standard.

5.4 Market-Pull

As noted earlier, PD had the idea for product development in the Gamma project. This, I argued, decreased SME's commitment and work performance. In this section I argue that this practice also hampered the Product Quality by basing the product on a bad idea.

The innovation literature makes a distinction between two types of factors influencing innovation, namely *technology push*, and *demand-pull* (or market-pull) (Michael, 1994). Product inventions based on technology push imply that the product is pushed into the market on the basis of new available technological opportunities, without proper consideration of whether there is demand in the market. In contrast, product inventions based on market-pull are developed in response to a need in the market (Michael, 1994). Scholars stress that inventions (e.g. the product idea) should be based on some degree of potential or existing demand-pull. The reason is that inventions not based on demand-pull run the risk of not having a demand in the market, and thereby fail commercially (Schmookler, 1966). In the

following section I argue that commercial failure in the Gamma project was a result of lacking demand-pull, caused by PD initiating the projects based on their own idea.

First it is important to notice that PD's approach was inconsistent with the intended bottom-up approach of the "Research for SMEs" funding scheme. The bottom-up approach acts as a mechanism that ensures that inventions are to some extent based on the actual needs of the market (EU Commission, 2010a). In contrast, the Gamma case became more of a top-down approach by establishing a project based on the idea of a technology developer without in-depth market knowledge. In this way, the product idea was not based on a direct demand-pull from the market, but rather a perceived demand-pull from the eyes of an outsider. PD's idea was to make a mussel-harvester that was more efficient by collecting a larger percentage of the mussels. However, this attribute was of little economic significance for the mussel industry since the current level of inefficiency was of minimal economic impact for the firms (Project Establisher). Due to PD's insufficient market knowledge, the entire idea was based on the wrong assumption that a more efficient mussel harvester would yield significant economic returns for the company. As a result, there were never any attempts to commercialize the product as this basic flaw in the idea became apparent during the product development (Project Establisher). The Gamma project thus inversely supports the theory that product ideas based on marked-pull increase the quality of the product (e.g., Schmookler, 1966).

The Gamma project highlights the importance of two mediating factors on PROPERF in the projects. First, the fact that such a flawed idea received funding indicates that the employees in EU, who are responsible for evaluating applications, do not always possess the necessary market knowledge to adequately evaluate which ideas. Thus, it highlights the importance of having competent project evaluators in EU in order to foster PROPERF.

Secondly, it emphasizes the importance of adequately using the consortium partners' market knowledge to evaluate the product ideas. It is surprising that such a basic flaw in the idea would not be discovered earlier, given that the consortium included companies engaged in mussel harvesting. For instance, Gamma reported that "I did not understand the point of the project" This indicates that Gamma did not share PD's view of the commercial potential of the new mussel harvester. It also indicates that PD did not manage to make use of their partner's market knowledge to critically investigate the quality and commercial potential of the product idea. On the contrary, the empirical findings give the impression that PD seemed more interested in trying to talk the firms into participating in the project. For example, both Gamma and Alpha said that they participated in the PD- initiated projects in order to be "nice" (in the case of Alpha the respondent referred to other projects he participated in). This indicates that SME participation was not motivated by a positive evaluation of the idea's commercial potential, but rather to satisfy TI, which apparently exhibited a desire to include them.

5.5 Flexibility versus the Requirement of International Participation

Several scholars stress the importance of flexibility in innovation projects due to their uncertain nature (West & Smith, 1998; Damanpour, 1991; West et al, 1998). Flexibility is commonly defined as the ability to adapt to different circumstances (Jansen et al, 2005; Damanpour, 1991; West et al, 1998). Throughout the research process several project characteristics were identified as influencing the flexibility of the consortium to conduct the projects in the most beneficial way. One of the already mentioned project characteristics is EU's requirement that the large majority of funding must be used to sub-contract R&D to RTD performers. Another example is the automatic delegation of the coordinator role to the SME. Due to space limitations, only one additional project characteristic will be analyzed in

relation to flexibility, namely EU's requirement to include international partners in the consortium. The INNOCAP analysis indicated that international participation contributed to tacit knowledge transfer to the SME. These include new ways-of-thinking, new perspectives (new awareness of the value of their competencies in other markets), and attitude changes, such as increased international focus.

As mentioned, the funding scheme requires the consortium to consist of at least three SMEs and two RTDs from different Member states or associated countries (EU Commission, 2010a). Consequently, the SME and PD did not have the freedom to choose whatever partner they wanted for the project. This, I argue, could hamper the product development by forcing the SME to include less relevant or competent partners for the project at hand. The SME interviews supported this hypothesis to some degree: "I absolutely think that a Norwegian consortium in many projects could have done it just as good, if not better. However, in some projects it has defiantly been beneficial having international partners" (Project Manager 1). Similarly, Project Manager 2 reported that:

> It (the EU demand to have an international consortium) limits our flexibility to choose partners. Sometimes this can inhibit us from establishing an optimal consortium…Sometimes we have to settle with, for instance, a half competent partner in Spain instead of a really competent partner from Norway.

These comments point to some inconsistencies between EU's requirement and factors fostering PROPERF. One of the purposes of the funding scheme is to promote international cooperation. However, to make international participation a requirement for all projects can sometimes result in reduced flexibility for the SME to include the best partners. Similarly, Alpha felt that PD included organizations from peripheral countries like Estonia and Lithuania in the consortium in order to be politically correct and increase the chances of funding (few applications included organizations from these countries, and EU wanted them

more involved in the FP). However, Alpha did not see this as beneficial for the actual product development.

To conclude, the empirical findings suggest that the requirements to include international organizations in the consortium can sometimes reduce PDS and Product Quality by inhibiting the establishment of an optimal consortium for the project at hand.

5.6 PROPERF: Conclusion

Several project characteristics were found to impact PROPERF. Briefly summarized, the findings suggest that Product Quality and PDS were strengthened by the delegation of tasks to partners with the most relevant competencies. In contrast, the other project characteristics pointed towards having a negative influence on PROPERF. For instance, several project characteristics were found to impede motivation of partners to perform. Also, rigid requirements by the EU were found to inhibit PROPERF by impeding the flexibility of the consortium.

6. INNOCAP versus PROPERF – the Relationship Between Tangible and Intangible Innovation Outputs

In the previous sections I analyzed ways in which specific project characteristics influenced INNOCAP and PROPERF. In the following section I will investigate how certain project characteristics influenced the relationship between the two dimensions. Project characteristics analyzed in both previous sections will be used for the comparison.

6.1 The role of Coordinator

As innovation projects are increasingly done in collaboration, firms' innovation capability is therefore increasingly influenced by their ability to collaborate (Simonin, 1997). The INNOCAP analysis suggested that the projects were conducted in a way that created few

mechanisms for the SMEs to acquire such collaborative know-how. The main reason was that PD took the role as a coordinator, which implied doing tasks that facilitated acquisition of collaborative know-how.

In contrast, the delegation of the coordinator role to PD positively affected PROPERF. The main reason was that TI, through 10 years of experience of acting as a coordinator, had developed expertise skills in doing the tasks involved. In comparison, the SMEs had never before acted as a coordinator. Also, Jansen and colleagues (2005) argue that acquisition of collaborative know-how is conditioned by the type of collaboration experience. In light of this theory, the SME would not have the relevant collaborative know-how since the project deviated from their previous collaborative experiences (e.g., number of partners, international participation, risk, financial size).

Thus, the two analyses indicated that having PD act as a coordinator positively affected PROPERF, but negatively affected INNOCAP. If, however, the SMEs had acted as the coordinator (as intended by EU), this would have caused an opposite effect by stimulating INNOCAP but impeding PROPERF. The analysis therefore indicates that the delegation of the coordinator role facilitate a trade-off decision between fostering INNOCAP or PROPERF.

6.2 International Consortium

In this section I will compare the inferences from the INNOCAP and PROPERF analyses to investigate how EU's international consortium requirement influenced the relationship between the two dimensions.

In relation to INNOCAP, the analysis pointed towards international participation as influencing the SMEs' acquired tacit knowledge, such as new ways of thinking, perspectives, and attitudes. Based on the findings, I argued that having international participants in the

consortium positively affected the SMEs' innovation capability through transfer of tacit knowledge.

In contrast, EU's requirement to have international participation was found to have negative effects on PROPERF (Project Manager 2, Alpha). The main reason was that it hampered the flexibility of the consortium to include the most relevant partners. As a result, the two analyses indicated that having international partners had an inverse effect on INNOCAP and PROPERF.

6.3 Participation in Decision-Making

So far, the analyzed project characteristics had opposite effect on PROPERF and INNOCAP. However, the empirical findings suggested that participation in decision-making had a more similar effect on the two dimensions. I argued in the INNOCAP section that participation in decision-making stimulated transfer of tacit knowledge through gaining insight into PD's ways of thinking about innovation and product development. It also gave the SMEs feedback about their own ideas and suggestions, thus making the SMEs re-evaluate their own ways of thinking and doing things (Alpha and Beta).

Similarly, the empirical data indicated that participation in decision-making positively influenced PROPERF by improving the quality of decisions during the project. For instance, both Beta and Alpha reported that PD actively assisted them in refining the product idea and helped them by suggesting ways to conduct the product development. Both SMEs saw this as contributing to the increased quality of their idea and the decisions made during product development. However, participation in decision-making did not emerge as having a solely positive impact on PROPERF. In the case of Beta, active involvement of partners in the decision-making process was reported to hamper the PDS due to the partners experiencing difficulties in gaining consensus. Project Manager 2 argued that this was a recurring

challenge in several projects as they sometimes found it difficult to convince SMEs with lacking competencies of why one solution is better than another. I therefore concluded that participation in decision-making had an inverse effect on the Product Quality and PDS indicators of PROPERF. Still, being actively engaged in the decision-making process serves as an example of how certain collaboration forms can have a positive influence on both INNOCAP and some aspects of PROPERF.

6.4 Conclusion INNOCAP versus PROPERF

In this section I have made an analytical comparison of ways in which specific project characteristics influenced the relationship between INNOCAP and PROPERF. The analysis suggested that project characteristics can affect the relationship between PROPERF and INNOCAP in varying ways. Some facilitated an apparent inverse relationship between INNOCAP and PROPERF. Other aspects influenced the two in more similar ways. Next, I will move on to a more general conclusion.

7. General Conclusion

This thesis has set out to answer the following research question: in what way does the "Research for SMEs" funding scheme influence innovation in SMEs? To answer the research question a multiple case study of three projects was chosen. Both existing theory and explorative approaches were used to identify project characteristics influencing innovation in SMEs. Data was collected through semi-structured interviews with three SMEs and their main RTD performers, as well as written material such as project reports and official papers describing the funding scheme. "Innovation in SMEs" constituted the dependent variable and was conceptualized as consisting of two dimensions: Innovation Capability of the SME (INNOCAP), and Project Performance of the consortium (PROPERF). In the individual analysis of INNOCAP and PROPERF some aspects were found to stimulate the respective dimension, while others to impede it. With regard to INNOCAP, the findings indicated generally poor conditions for transfer of tacit knowledge due to limited contact between the SMEs and their partners. However, the reports indicated that some tacit knowledge was acquired through involvement in decision making and international participation. In addition, the SMEs accumulated technological know-how by doing part of the R&D in-house. In terms of PROPERF, the findings suggest that Product Quality and PDS were strengthened by the delegation of tasks to partners with the most relevant competencies to do them. In contrast, other project characteristics were found to impede PROPERF. For instance, the analysis indicated lacking intensives for partners to perform at their best. Also, rigid requirements were found to hamper flexibility, such as having international participants and earmarking the majority of funding for RTD performers to conduct the R&D.

The subsequent comparison of the two analyses suggested that some project characteristics have an inverse effect on INNOCAP and PROPERF, while others have more similar effect on the two. In these final sections I will first evaluate study limitations and propose

suggestions for future research. Secondly, political and theoretical implications of the study will be discussed.

6.1 Limitations and Suggestions for Future Research

It is important to emphasize that both PROPERF and INNOCAP are broad concepts influenced in a variety of ways by even a single project characteristic. To explore the full causal relationship between of a project characteristic and the dependent variables is both beyond and beside the scope of this thesis. Rather, the purpose of the thesis is to study project characteristics which emerged as having a significant influence on innovation in SMEs, and identify the main mechanisms by which they did so. This does not exclude the fact that these project characteristics can influence the dependent variable through other mechanisms as well. Policy makers and firms could benefit from more in-depth knowledge about the variety of effects caused by specific ways of collaborating or designing funding schemes. To gain such knowledge, a suggestion for future research is to conduct more in-depth explorative studies to identify the variety of ways in which single aspects of collaborations/funding schemes influence innovation capability and project performance.

Another limitation is the exclusion of the projects' effects on the firms' additional innovation activities. Mol (2005) argues that sub-contracting R&D activities which are not related to firms' core activities can positively influence innovation in the firm. The reason is that it frees human resources, which can instead be used on innovation activities more related to their core competencies. In this study I have not included ways in which the projects affected the SMEs' additional innovation activities at the time of the project. However, both Beta and Alpha had other R&D activities running parallel with the project. Although active involvement in the project could increase the SMEs' innovation outcomes of the project, it may tie up resources which can negatively influence the SMEs' additional innovation

activities. I argue that in order to gain a more comprehensive understanding of the ways in which projects influence innovation in SMEs, the effect on their additional innovation activities should be taken into consideration.

A large number of theories were used to explain the mechanisms by which project characteristics influence innovation in the SMEs. Due to space limitation I did not have the opportunity to include an extensive literature review, including exposition of controversies and gaps, and critical evaluations of each theory. This may have resulted in an apparently uncritical use of theory. However, several theoretical criticisms and reflections were incorporated into the analysis section. Also, it is worth re-mentioning that I used theories that have shown explanatory power in other relevant studies, and that are widely accepted in the academic community.

As mentioned in the methodology chapter, the study facilitates conditions for making theoretical generalizations. This implies that the inferences about ways in which specific project characteristics affect INNOCAP and PROPERF could be used to understand and evaluate other projects with the same characteristics. However, due to the small sample, there are no conditions for making statistical generalizations about the existence and frequency of occurrence of these characteristics in other projects. The value of knowledge about ways in which various project characteristics influence innovation in SMEs is mediated by the frequency of occurrence of these characteristics in collaboration projects. For example, there is little value in knowing how a certain collaboration form influences knowledge transfer if it is rarely used. A suggestion for future research is therefore to conduct studies with large samples to identify the frequency of various characteristics (e.g., ways of collaborating or funding scheme designs). Such knowledge could alert researchers of what kind of characteristics are valuable to gain knowledge about. Also, such studies can reveal the degree to which studies like my own can be theoretically generalized to other projects.

6.2 Policy Implications

Several of the project characteristics analyzed were related to the design of the funding scheme. The effect of these characteristics on innovation in SMEs can be of value to policy makers. In the Gamma project, PD had the idea for product development. This finding can be of interest to EU officials as it is opposed to the funding scheme's intention to assist SMEs in realizing *their* ideas. The findings suggest that better routines are needed to ensure that the ideas actually originate from the SMEs. Also, the fact that the application for funding was approved despite not being based on an actual need in the market suggests weaknesses in the application process. In the application, PD argued that the mussel harvester would be cost effective by reducing labor costs. The reason was that it would automatize work that was originally conducted manually by workers. However, in terms of documenting market demand, the application report was limited to this general argument. For example, there are no calculations estimating the potential cost savings of mussel harvesting companies as a result. Based on this finding I argue that the "Research for SMEs" funding scheme could benefit from requiring more thorough documentation of the desired positive effect of the innovation. In the case of Gamma, where cost effectiveness was the major drive for the product innovation, more detailed estimates of such economic benefits should be required in the application.

6.2.1 Implications of Inverse Effects of Funding Scheme Designs

The analysis indicated that certain project characteristics can have an inverse effect on INNOCAP and PROPERF. Among other things, this highlights the importance for policymakers to take into consideration the variety of effects caused by designing funding schemes in certain ways. More precisely, the indication of inverse effects on INNOCAP and

PROPERF suggests that policy-makers, in some cases, have to make choices between focusing on promoting intangible outputs like knowledge transfer, or tangible outputs like faster PDS, and better Product Quality. An example was EU's delegation of the coordinator role to the SMEs. Although PD carried this job out the tasks in practice, the respondents' reports gave strong indications that if the SMEs had actually acted as a coordinator, this would have significantly impeded PDS (Project Establisher). The reason for this was that the SMEs had limited available resources and no project management experience in such projects. In contrast, theories (e.g., Simonin, 1997; Jansen et al, 2005) suggest that acting as a coordinator could have increased SMEs' acquisition of collaborative know-how. The example emphasizes the potential danger of getting too focused on one specific goal (e.g. increasing SMEs acquisition of collaborative know-how). This may lead policymakers to neglect other potentially negative effects caused by the designing funding schemes in order to reach that goal (e.g., PDS).

I argue that policymakers may benefit from using frameworks similar to the one developed in this thesis. For instance, they can differentiate between intangible and tangible innovation outputs, and analyze what kind of effect specific aspects of the design can have on these dimensions. This can sensitize policymakers to how certain requirements/designs can have varying consequences. Such an approach could prove useful in order to avoid designing funding schemes with unintended negative effects.

6.2.2 Consistency Between Funding Scheme Design and Stated Goals

The analysis indicated that inconsistencies exist between EU's goals of the program, and the way it was designed. For example, one of the major goals of EU is to facilitate transfer of technological know-how from the RTDs to the SMEs (EU Commission, 2010b). According to innovation literature, transfer of technological know-how entails either close monitoring of

others performing the technical skill, or hands-on engagement (e.g., Nonaka, 1996; Nonneman & Vanhouldt, 1996; Killing, 1983; Teece, 1977; Granovetter, 1973). Despite this, the "Research for SMEs" funding scheme does not fund SMEs' own R&D activity. This finding indicates that the funding scheme does not facilitate transfer of technological know-how. In light of theories of technological know-how transfer, I therefore argue that the policy of funding only the R&D conducted by RTD performers is inconsistent with its goal to stimulate transfer of technological know-how to the SMEs. This inference points to the importance for policymakers to make sure that there is a consistent relationship between the intended goals of the funding scheme, and the requirements of how the projects shall be carried out.

6.3 Theoretical Implications

The study contributes to current research by suggesting a new approach to studying tacit knowledge transfer. As illustrated, scholars have distinguished between various types of tacit knowledge and studied factors influencing their transfer. However, to the best of my knowledge, no prior research has studied the transfer of various types of tacit knowledge in a particular case. This study suggests that such an approach can be fruitful in assessing firms' outcome of collaborations more precisely. However, developing a more valid method for measuring various kinds of tacit knowledge entails extensive work and requires a joint effort by many researchers. For instance, more knowledge about factors influencing transfer of such knowledge is needed. Despite the increased recognition of the importance of tacit knowledge, several scholars have pointed out the lack of such research (e.g., Cavusgil et al, 2003; Madahaven & Grover, 1998; Howells, 1996). Also, an effort should be made to differentiate the various types of tacit knowledge from one another, and develop measures of each one

with adequate discriminant validity[5]. I am not suggesting that the method used to measure various types of tacit knowledge is of high quality. Rather, I have tried to make the best out of the scarce literature, and illustrate the possible benefits of further work in this field. Hopefully this study can inspire some researchers to embark on these difficult but important tasks.

Last, many scholars have focused on the ways in which various ways of collaborating can influence either project performance (e.g., Parker, 2000; Sethi, 2000; Chilling & Hill, 1998) or innovation capability (Cavusgil et al, 2003; Arora and Gambardella, 1990; Adams & Dougherty, 1998; Moorman & Rust, 1999) . However, no prior research has (to the best of my knowledge) dealt explicitly with how specific project characteristics influence the relationship between such tangible and intangible innovation outputs. Perhaps the most notable inference was that certain project characteristics, such as the delegation of the coordinator role and the requirement to have international participants, can have opposite effects on INNOCAP and PROPERF. I welcome other researchers to confirm my findings and hope that these inferences inspire them to study how other project characteristics affect such tangible and intangible innovation outputs.

[5] Campell and Fiske (1959) introduced the concept of discriminant validity and described it as the degree to which the operationalization of a theoretical concept does not highly correlate with operationalizations of other theoretically different concepts.

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Appendix – Interview Guide for SMEs

Introduction:

I will remind you that you will remain anonymous in the final paper, however PD will have knowledge of your participation. Is this OK?

After the interview I will send you a transcription of the interview which you can approve and make additional comments to if you want. Does that sound fine?

Introduction Questions:

- What was your position in the company during the project?
- What was your role in the project?
- Were you the official contact person to PD during the project?
- How many employees does your company have?
- Will you say your company is the high-tech or low-tech?

General Questions

- What was the goal of the project?
- Did you achieve the goal?
- Did you commercialize the product?
- Who had the idea for the product innovation?
    - Why did you not develop the product before
- Did PD assist you in crystallizing the idea?
- How did you come in contact with TI?
- How did you hear about the “Research for SMEs” funding scheme?

Network:

- Had you previously worked with some of the partners in the consortium?
    - If yes: Whom?
- Can you tell me about the process of finding partners for the project?
    - Who found whom?
- How will you characterize TIs ability to find relevant partners for the project?
- Have the partners in the project later set you in contact with other organizations?

Interaction and communication:

- Can you tell me a little bit about the frequency and type of contact you had with partners furing the project?
- Can you tell me about the kind of meetings you had?
    - How often?
    - What was the form and content of the meetings?
- How often did you have contact with PD during the project?
- What kind of contact did you have with PD during the project?
    - Face to face, telephone, e-mail?
- What kind of contact did you have with other partners during the project?
    - Face to face, telephone, e-mail?
    - How much of the total contact will you estimate long distance communication constituted?
- Have you had any contact with any of the partners in the project after it ended?
    - What kind of contact?

    - Has this been a valuable contact?
        - In what way?
- On what level was the contact?
- Was it only you from your company who had contact with partners in the consortium?
- Did you receive any written documents from PD during the project?

Collaboration form:

- Can you describe how the product development was carried out?
- Who did what during the project?
- What did your company do?
- What did PD do?
- How will you evaluate the delegation of R&D work? Did you feel that you managed to make use of each other's competencies?
- Do you wish you were more involved in the R&D work?
    - Why? Why not?
- Who were involved in the decision-making process?
- Were you actively and creatively involved in the decision-making process?
- Did participation in decision-making result in any disagreements?
    - What kind of disagreements?
- Did you feel you possessed adequate knowledge about the product development in order to make good decisions?

General questions about knowledge transfer:

- What kind of knowledge did you acquire through the project?

- How will you value that knowledge?
- Did the project have any influence on how your company work or think about innovation ?
-

Technological know-how:

- Who did the R&D?
- Did your company do R&D before the project?
    - If yes: How does your R&D activity deviate from the R&D conducted during the project?
- Was there any face-to-face contact during the R&D?
- Did you have contact with technical personal or other non-managerial personnel?
- Did you acquire any new technical skills or competencies during the project?
- Did you feel that you acquired enough knowledge about the project to independently carry it on after the project

Collaborative know-how:

- Who were the coordinator during the project?
- Did you do any form of project management?
- Did you feel you acquired any experience by collaborating with others?
    - What kind of experience?
- How will you compare your competencies and knowledge to TI?
    - How was it similar/different?

International Participation:

- Did you have any previous experience collaborating with international organizations?
- What kind of contact did you have with the international participants?
- Did this experience contribute to you being more positive to collaborating with international organizations?
- Did you acquire any new knowledge of any kind from interacting with the international participants?
- Were there any challenges working with international partners?
- How did you establish the consortium?
- Which partners in the consortium did you include?

Motivation and Commitment:

- How will you evaluate your own the the other partners motivation during the project?
- Was there any particular things which affected the motivation during the project?
- Concluding question:
- What will you say were the best things about the projects?
- What will you say were the worst?
- Would you have done anything differently today ?